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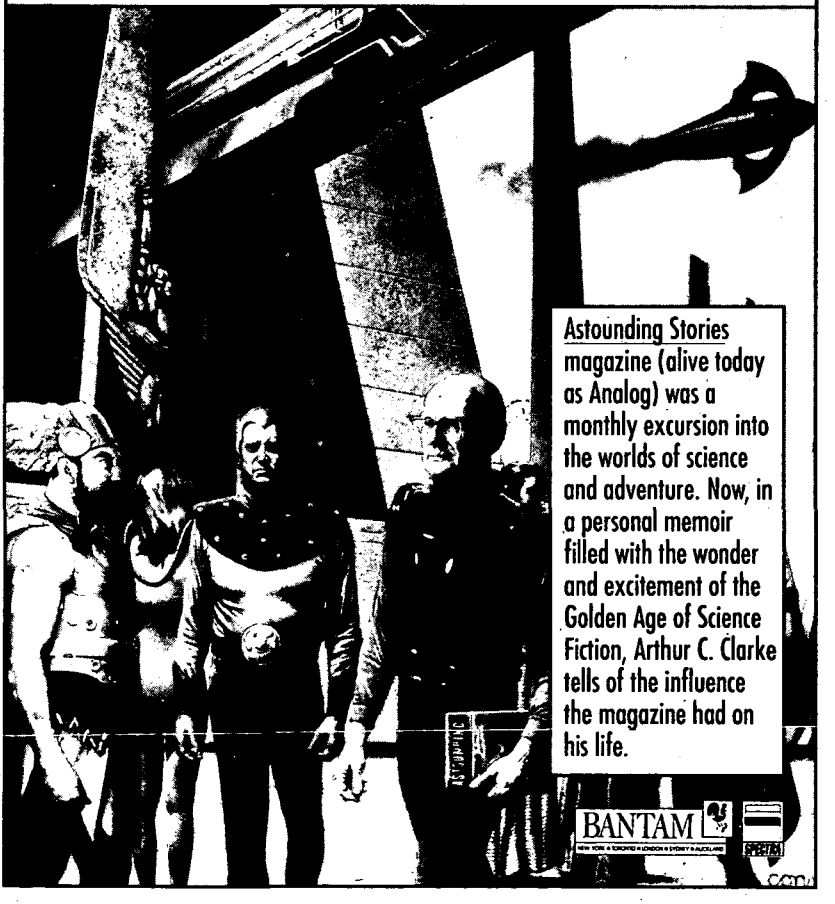

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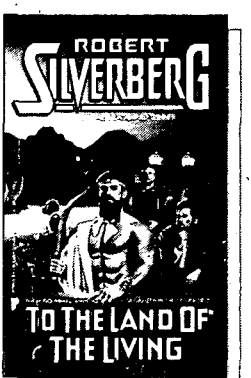

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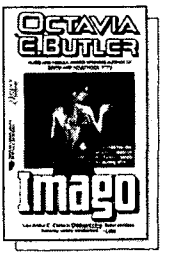

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When you see me around, ask me about apes, ants, and evolution (it's springtime after all).

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Editorial

MATTERS OF ATTITUDE

Stanley Schmidt

Over the years I've heard a number of people express hostility and/or disillusionment with science and/or technology—a complex of attitudes that has seemed particularly prevalent recently. In a somewhat related vein, there has long been a tendency for the "literary critical establishment" to look down its academic nose at science fiction. That tendency has been *less* prevalent in recent years than it used to be; for example, science fiction courses are now in the curriculum at many high schools and colleges, and science fiction is considered an acceptable topic for dissertations and scholarly journal articles. Acceptable to some, anyway—academics who teach such courses or publish such papers sometimes complain that such activities seem to be, at best, *tolerated* by their more conventional colleagues.

So even if hostility to science and technology is currently "up" a bit, and that toward science fiction is "down," both are still with us, and likely to remain so. Why? Just what is it that some literary scholars dislike about science fiction, and some people of many backgrounds dislike about science or technology? And are their complaints valid?

At first glance, the questions may seem to have little to do with each other, and may seem to some to be of little import anyway. "Who *cares* why they don't like us?" But the questions are *not* unrelated—science, technology, and science fiction have always existed in a sort of symbiotic relationship, with ideas from each influencing the development of the others. And the questions cannot be dismissed as unimportant. Science and technology have become profoundly important to the way human civilization has developed and will develop in the future, and science fiction

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is the "advance guard" that attempts to scout out how that future development may go. Attitudes toward these fields, both academic and popular, are likely to have profound effects on the shape of our future—and so need to be understood and, perhaps, modified.

I've recently been comparing views with a friend who has professional feet in both science fiction and academic camps, and confesses to having experienced a certain amount of recent disillusionment with science and technology himself. As I look over my exchanges with him and with several other people, it seems to me that some of the common attitudes can be summed up as follows:

1. Literary academics tend to dislike science fiction because they perceive it as having too much emphasis on "things" rather than "people." By this they may mean that it deals too much with science and technology and not enough with other aspects of human thought, feeling, and endeavor. I have heard some dismiss it as "trivial" because it may give as much attention to the characters' environment as to the characters themselves. I believe it was William Faulkner who said, at least approximately, "The only thing worth writing about is the human heart in conflict with itself."

2. Some people dislike science and technology because of destructive consequences that have resulted from scientific and/or technological activity, such as nuclear bombs, air pollution, and so on.

3. Some recognize the beneficial effects that have also come from scientific and/or technological work, such as improved medicine and agriculture, but are disturbed that these benefits are not uniformly distributed among all people. They may see science (by which they frequently mean any form of science or technology, smearing the two together and failing to make any distinction between them) as just another of many tools used by rich people to exploit poor people, or to amuse and pamper themselves while simply ignoring the poor. Some see "science" (in the same loose sense) as being "about the wrong things," devoted to toys such as high-resolution television and CD players instead of to broader concerns such as better health care and nutrition for everyone.

4. For all these reasons—bad products of science and technology, failure to distribute the good ones well, concentration on "frivolous" products rather than "important" ones—many say they do not trust science and technology to solve humanity's problems. Some say they *used* to, but have lost what confidence they once had.

If such attitudes became sufficiently widespread, they could easily bring research and development grinding to a halt. People who hold them, at least in their more extreme forms, may think that would be just lovely. I'm more inclined to think it would be disastrous. So what can a person who believes science and technology are essential to our future welfare, and perhaps even survival, say in response to such concerns as those above?

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Well, for starters, a few direct comments. . . .

1. Anybody who's actually *read* much science fiction in recent years knows that much of it *does* deal at least as much with other aspects of human life as with science and technology. The best science fiction deals with entire worlds, in *all* their aspects. As Poul Anderson once wrote, it requires a "unitary" approach, in which "philosophy, love, technology, poetry, and the minutiæ of daily living would all play parts concomitant with their roles in real life, but heightened by the imagination of the writer." A more realistic criticism might be directed the other way: that while the best science fiction deals with *all* those things, the vast majority of "mainstream" literature chooses to ignore one of them.

As for dismissing the characters' environment as "trivial," I shall say only that this seems an astonishingly arrogant

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attitude to take toward the rest of the universe. It also seems directly responsible for many of the very real problems we presently face. Perhaps that portion of academia which has for so long encouraged such attitudes must bear part of the blame for our environmental difficulties—which, after all, result in part from a long tradition of kidding ourselves that only *we* are important, and need not concern ourselves with "mere environment."

Surely "the human heart in conflict with itself" is *a* thing worth writing about. But to say that it's the *only* thing worth writing about betrays a grotesquely distorted—and possibly self-destructive—conception of man's place in the universe.

2. Yes, discoveries and inventions have been used to do bad things, sometimes intentionally, sometimes unwittingly. Fire can be used to cook; it can also be used to destroy property. If you learn to do either, it's such a short step to the other that you might as well consider it taken. If you try to hide from that fact by refusing to do either yourself, it will do you no good. If it *can* be done, someone *will* do it. As John W. Campbell was fond of saying, "Mother Nature is a blabbermouth. She'll tell anyone who asks the right questions."

As for unwanted side effects such as air pollution, we learn by making mistakes. If we never did anything until we had all the bugs out of the method, we'd never do anything. It's worthwhile to learn, even if the process does involve making some messes that have to be cleaned up.

3. The distribution of benefits is one of those things that we haven't yet learned to do very well, but it does happen—even to the "have-nots," though the process may be frustratingly slow. Life expectancies may be in the seventies in industrialized nations and only in the fifties or sixties in the Third World—but they used to be in the *twenties, everywhere!*

As for science being "about the wrong things," let's start by getting the terminology straight and emphasizing that there *is* an important distinction between science and technology. *Science* is *not* about "toys such as high-resolution television and CD players." Science is just about learning how the Universe works. High-resolution television and CD players, *and* better health care and nutrition for everyone, are things that are done with the *results* of science by a complicated interplay of technology, psychology, politics, and economics—among other things. There are scientists, technologists, politicians, and all kinds of other people working on all kinds of problems, including both "toys" and the distribution of food and medicine. That is as it should be. Only history will tell which efforts were the really important ones—and history has repeatedly shown that one generation's "playthings of the rich" tend to become the next generation's "necessities." If some of the benefits don't spread as fast or as uniformly as we might like, that has nothing to do with what science is about. It has everything to do with how research is funded and resources dis-

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tributed—and those are matters of overall social organization. They involve *everyone*, not just—or even primarily—scientists and technologists.

4. *Should* we have confidence in the ability of science and technology to solve mankind's problems? Of course not—not by themselves. Science and technology are just tools. What they do *for* you is entirely dependent on what you do *with* them. Good tools can help you do almost any job better; they can also do plenty of damage if incompetently handled. Merely *owning* a good tool is not enough. You have to learn how to use it. Merely having a highly developed science and technology will not solve man's problems—but learning to *use* them well and wisely can be an enormous step in that direction.

We're working on it.

As a closing analogy, let me call your attention to a piece of technology that not even the most ardent "humanist" could accuse of having an "anti-human" purpose. Such players as Jascha Heifetz, Isaac Stern, and to a lesser extent thousands of others, have demonstrated that a violin, especially a very good one like a Stradivarius, can produce beautiful music. But it doesn't just do it by *being* a Stradivarius violin. The music must be coaxed from the instrument by a player who has devoted a large amount of time and concentration to learning both technical skills and proper attitudes—toward instruments, listeners, and the music itself. In the hands of a person who hasn't learned those things, the most magnificent instrument will produce the most goshawful racket.

But even a Heifetz can't make beautiful music without a good instrument.

Our species should not waste its time bemoaning the fact that the violin was ever invented. Our efforts would be far better spent striving to build our science and technology to the standards of a Stradivarius—and learn to play it like a Heifetz among civilizations. ■

●Though the familiar use of things about us takes off our wonder, yet it cures not our ignorance.

John Locke

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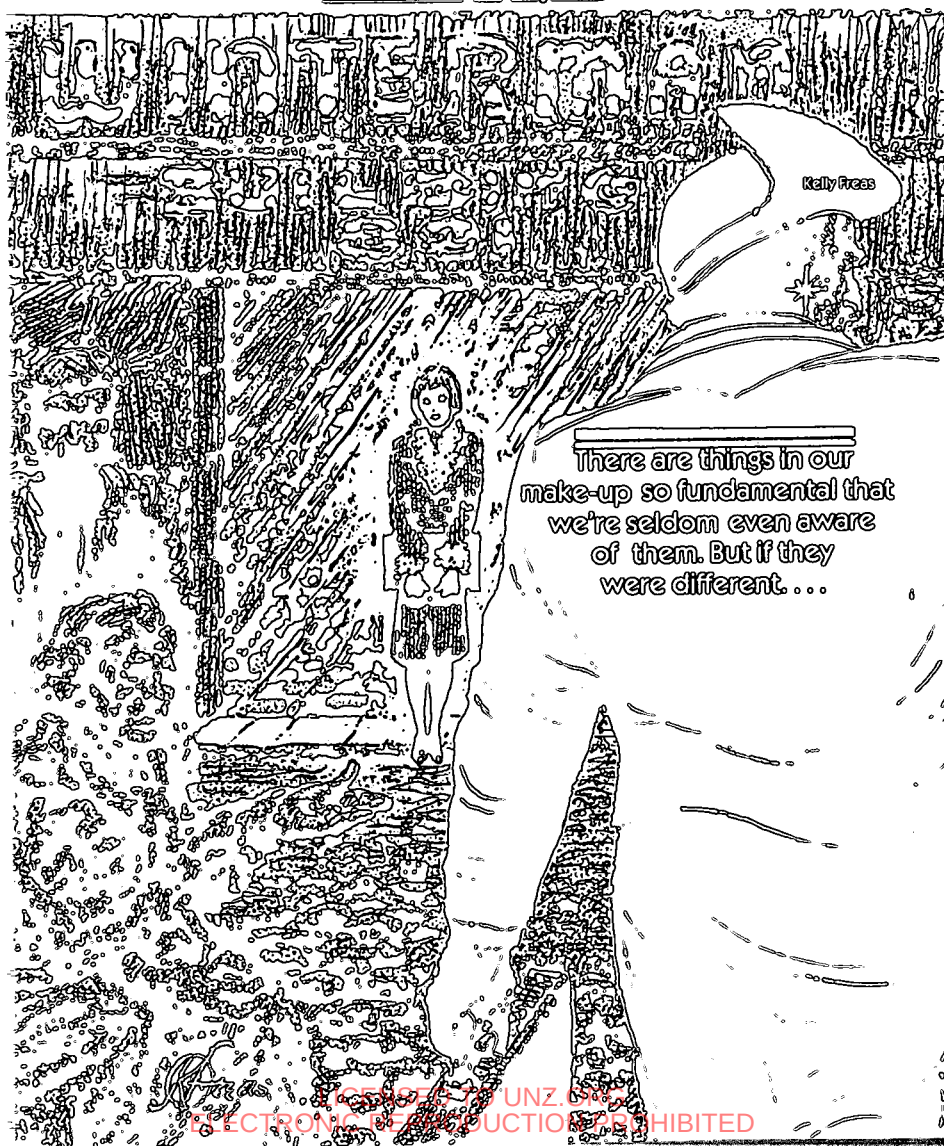

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It was not clear to him, even afterward, exactly why he had decided to ask for help. It might have been the woman gang-raped in Central Park. It might have been the addict sprawled out dead of an overdose on the corner of Maiden and Nassau. It might have been the sea of shiftless beggars that had inundated Washington Park; or the miasma of urine and cheap booze that permeated Penn Station. Whatever it was, he had reached the conclusion that humanity was being buried under a pile of living detritus; that the situation was clearly growing worse; and that there was nothing any human being could do about it.

Any human being.

PROLEGOMENON

What Ralph Hugo Winterman hated most of all about arriving at work in the morning was entering the Winterman building. Not that he hated the building itself, of course. It bore his own name, after all; and was, in a manner of speaking, the child of his loins—the reminder of a happier time, when he had had some hope of making a difference. Nor was it exactly that the building which had once been a symbol of hope had become instead a symbol, if not precisely of defeat, then of irrelevance. The human flotsam that clogged the City had parted briefly during the building's construction, lapping around the edges of the work site like a pool of acid; then it had closed up again and reclaimed the street, the plaza, sometimes even the lobby itself; as indifferent to the aspirations of the new structure as it was to the despair of the old.

No, all that was bad enough, that walk from the limo to the building's doors. The ragged, dirty men living in cardboard boxes set helter-skelter atop the steam grates, hurling vulgarities and sometimes feces at those who stopped and stared. The importuning of the beggars, hands outcupped, fingers twitching gimme, gimme, gimme. The hookers, brazen even in the daylight, hawking their morning specials while they waited for the noon rush. The pushers and their druggies—the small packets of white powder furtively exchanged; the thick wads of soiled bills bound with rubber bands. Yes, all that was bad enough.

But the worst part always came just before he opened the bright, glass, ten-foot doors.

"Morning, captain."

Winterman froze, as he always did, with his hand on the polished brass handle and his arm muscles tensed to pull the door open. Around him, a flock of aides hovered. The new ones awaited orders. The older ones simply waited.

Winterman turned his head and looked down on the man sitting on the newel block of the granite steps that fronted on the Winterman building. Spindly legs dangling from cuffed jungle shorts. Brown and yellow teeth smiling through a slovenly, unkempt, salt-and-pepper beard. Khaki bush jacket, stained and torn and smelling of too-long a usage; darker on the sleeve, where three chevroned shadows conjured the past.

"Sergeant Oakes," Winterman replied with a nod.

"Nice day, captain. Wouldn't you say?"

"There's a high pressure front mov-

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ing in from Ohio," Winterman told him. "The rainstorms tracked south of us, over Virginia."

"Why, thanks, captain." The lips parted into a gap-toothed smile. "I don't know what I'd do if it weren't for your weather reports." Oakes's breath was foul and smelled of cheap wine.

"It will be hot today. In the nineties. You shouldn't sit out in the sun, sergeant."

Oakes mopped his brow. "Aw, hell, captain. You and me, we've been out in hotter weather than this. Remember Bluefields? They could have scraped the sweat off'n us and sold it for irrigation water." He grinned at Winterman.

Winterman smiled briefly and yanked open the door to the lobby. The cool air inside rolled out and over him like an Arctic blast. Oakes rapped his messkit cup against the granite, a tinny sound that seemed somehow far away. "How's about a little something to see me through the day, cap'n?"

Winterman would not meet his eyes. "Get a job," he said, and stepped into the cold.

He could hear the whispered voices behind him. "*Who was that?*" "*Why did The Man . . . ?*" "*. . . Mosquito Coast . . .*" Winterman set his jaw and waited before the private elevator while eager hands reached out and stabbed the buttons for him.

The morning was busy. Mornings were never his own. He sat at the head of the broad, mahogany conference table and passed sentence on the proposals of a succession of Bright Young Men and Women—BMW's they were called by the Dull Old Men and Women who had long since passed that phase of their lives. The BMW's were all eager and aggressive and ambitious and determined to show Winterman how they were different from the rest of this year's crop.

(It was not that Winterman disapproved of eagerness. Once, a long time ago, he had been eager himself, and so he had a certain tolerance for it. But those he kept around himself would outgrow it, just as he had. They would remain aggressive and ambitious and determined, of course; but it would be a patient aggression, a cold ambition, a calculated determination. It was a cutthroat game he played. The game board was the world; and the tokens were economic giants and Household Names, bargained and exchanged with other Players as wily and as clever as himself. Patience and strategic thinking were required, never eagerness.)

"One does not win at chess," Winterman told the BMW who sat flustered among a shuffle of printouts at the distant foot of the board table, "by seizing every opportune pawn."

"But . . . this company is decidedly undervalued," the BMW protested holding forth a printout that Winterman did not bother to read. "If we buy in now we could . . ." His voice petered out as he saw that Winterman was not listening.

Winterman nodded and, in the polished tabletop, a shadow Winterman nodded at shadows. "Don't take it so hard . . ." He touched a button and the screen inset in the mahogany blinked the young man's name. ". . . Bill. The investment does look good—on the sur-

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face." He let his voice stress the last phrase just a bit. "The company is new and undercapitalized. Its Current Ratio is quite high, as is its Quick Ratio. On paper, it appears to be a very good acquisition. We could easily secure a senior interest by leveraging some of the more nervous investors. However . . ." And he raised a finger, schoolmaster fashion. "However, if you had dug more deeply you would have discovered that the ratios are not, in fact, as favorable as they appear. Their management have committed a substantial portion of the company's liquid assets to speculative research ventures in ZG production. Perhaps laudable as a point of human pride; but the odds are heavily against them, wouldn't you say?"

"The potential is great," the young man insisted, "and even if they fail, our losses would be minimal."

Secretly, Winterman admired the young man's grit. It took sand to stand up to the Old Man that way. Winterman did not care for sycophants, and those who caved in too quickly, he sent packing sooner than any of the others. Those who stood up to him too long, went packing later. That line, between obsequiousness and defiance, was a fine one to walk, especially for the inexperienced; but the winnowing process had to be swift and ruthless. The Game was hardball; the competition, fierce. Only the fittest survived. Those who could not call it must themselves be cut—for their own good, as well as the company's. Later, the culls would thank him for diverting them from careers in which they had no future. Society had many worthy tasks; tasks in which they could be more useful. There was always a need for good salesmen, bus drivers, comm techs. Just as every species had a niche in which it contributed toward the entire ecosystem, every person had a destined niche in which he could contribute toward the whole of society. Usefulness, as Lewis Thomas once said, was the common goal of nature.

"Perhaps, Bill. Perhaps," he answered the young man. "Yet The Winterman Companies did not achieve its present position by acquiring losers, no matter how small the loss. If you could show how the assets currently slated for research could be diverted to advertising to increase sales or, better yet, directly to dividends, your proposal might be worth a second look."

When the young man had gone, Winterman turned to the woman who had been sitting quietly at the side of the table. "Well?" he said rubbing his hands. "What did you think of Bill's proposal, Dr. Morton? Is there a chance of success?"

Bright red nails tapped against lacquered table top. "Is that why you had me sit through his presentation?" She shrugged with her hands. "No, Mr. Winterman, there is no chance of success. A human company cannot hope to compete with the Hraani in zero gravity manufacture."

Winterman nodded slowly. "Yes. Deep space is their milieu, after all. But that was not what I meant by 'success.' Success is when The Winterman Companies makes money on a venture. It does not depend on the outcome of the venture itself."

Morton looked at him. Large, liquid eyes, made larger by the clever use of

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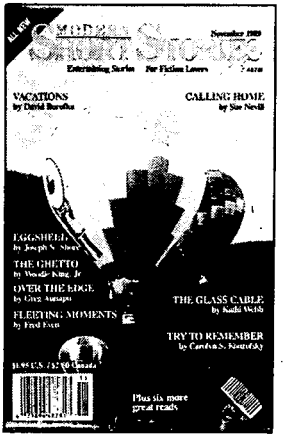

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cosmetics. "I am an anthropologist," she said, "not a businesswoman. You retained my services because of my studies of the Hraani."

"Yes." Winterman leaned back and studied her face. "To business, then. What I want from you is a daily briefing on the Hraani for myself and my senior staff. A seminar, if you will. There will be five of us. Will a half-hour a day be sufficient?"

She smiled with half her mouth. "One hour is more traditional. Three times a week."

Winterman believed in giving rein to experts within the scope of their expertise. "Very well. The time can be found. Arrange with my secretary for a convenient block."

Morton leaned her elbows on the table, twisted her fingers together as if in prayer. "Do you plan on doing business with them, Mr. Winterman?" she asked bluntly.

"With them—?"

"The Hraani. Because if you do, I strongly advise against it. What we know for certain about them would fit on a file card. A small file card. We know they have two major races. We know they can use sunlight, like plants. We know that their language has certain structural similarities to the Semitic tongues. We know that their senses differ from ours in various ways, especially in their lack of proprioception. But we know little of real importance. What are their social arrangements? Their literature? I've read some of their poems—I think. But I have no idea *why* they are poems. What is the signifigance of the dagger they wear? 'To cut the strings,' they say; but what does that mean? And why do they toss pixie dust in the air?" She threw her arm out in a familiar Hraani gesture; held it a moment; then shrugged and sagged into her chair. "We know so little about them," she repeated.

He waited her out patiently. "We know that they are a disciplined, military people," he said.

"Do we?"

"I have never seen a hran out of uniform," he told her. "Have you?"

"Johnny Starbuck."

A wave of dismissal. "He doesn't count."

Morton puckered her lips and gazed thoughtfully into the distance. "No," she admitted. "No, I haven't. But what does that mean? How many Hraani have we seen down here? A few thousand? There are millions of them in the TransPluto artifacts."

Winterman shrugged. "Even if they do have civilians up there, they only send their military down-system; and those are the ones we must deal with."

Morton frowned and studied her nails. "If you are asking me for my advice," she said, "my advice is don't deal with them at all."

"As you said, you are an anthropologist, not a businesswoman." They locked gazes for a moment and Morton was the first to look away.

"If there is nothing else?" she suggested.

"There is. One thing I must settle this morning."

"What is that?"

"Are they honest?"

She gave him a quizzical look. "Honest?"

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"The Hraani. If they make a bargain, do they keep it?"

She raised an eyebrow. "I suppose they are like other people. Some will and some won't. They are individuals, you know, not racial stereotypes. They vary, just as we do."

"But they have the *concept* of honesty, do they not?"

"They have a word of sorts in their major language. But—"

"A word 'of sorts'?"

Morton sighed. "Does the seminar begin now? Do you want a language lesson in *B'niirë*? If you do, I am not prepared. My materials—"

"I want my question answered." Winterman spoke sharply. He was not patient with hirelings who dithered. "Just explain what you meant by a 'sort of' word?"

Morton tapped her nails against the wood for a moment. They made a sound like tiny pebbles. "As nearly as we can tell from Johnny Starbuck and the others like him, *B'niirë* consists entirely of nouns."

"Nouns."

"Yes. Words that describe things."

"I know what a noun is," he snapped. He leaned back in his chair. "How do they describe actions, then?"

"They verb their nouns."

"What the devil does . . . ? Oh. I see."

"Yes. Take a word, like . . . oh, like 'table.' " She rapped the shining mahogany with her knuckles. "That would be *lf t*. The word *alf t* would mean something like 'the building of a table' and *alfeit*, 'the placing upon a table.' *Lfet* connotes 'table-like' or perhaps 'flat.' And so on. There are sixteen forms of the word, each putting a different spin on the basic concept. They are modified by altering the vowels."

"I see. It sounds very logical." Rational, he thought. Ordered. Exactly what he would expect from a disciplined folk like the Hraani. "And honesty?"

Morton folded her hands into a ball on the table. "That's where we enter a grey area. Their psychology. A people's outlook—their soul—is found in their adjectives; and the Hraani have none, *per se*. A language consisting entirely of nouns implies a rather literal imagination, does it not? One that lacks—or that may lack—abstractions. There is a word that might mean 'honesty': *X' rt*." (It sounded to Winterman as if she had cleared her throat). "But most scholars believe it means something more like 'an honest act.' Again, the tangible rather than the intangible. *X'rit* is the so-called 'adjectival' form. It could be taken as 'honest' or, more precisely, as 'the features of an honest act.' "

"I see."

"There is another word, *sgl*, which means 'an agreement' or 'a bargain.' So 'an honest bargain' would be *sgl x'rit*." She hissed the words and spat them.

Winterman smiled. " 'Seagull krit.' Well, there it is. Thank you, Dr. Morton. I wasn't sure if the concept existed in their language or not."

"Yes," said Morton. "But sgl x'rit shu x'rt sgöl."

Winterman thought a moment, then he smiled thinly. "I shall keep your advice in mind." He pulled a slip of paper from his vest pocket, unfolded it and smoothed it out. He read the words he had scribbled on the slip. "One more

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question, Dr. Morton," he said. "What is the meaning of 'advaydy shew chosen'?"

Morton looked blank. "That doesn't make any . . . Oh. You must mean *adveidy shu-ch'sen!*" She cocked her head. "Why?"

He looked at her across the conference table. "That is none of your concern. I hired you to answer questions."

"You would be better served had you hired me to *ask* questions."

"Just answer me, please," he snapped.

Morton's eyes tightened. "It is one of the more tasteless Hraani concepts. It means 'useless people.'"

Winterman returned her gaze calmly. "And why do you find that concept so tasteless? Surely you cannot deny that there are useless people in the world. One must climb over them to enter this very building. Failures. Washouts. Parasites."

"I realize that there are such unfortunates—"

"Come, Doctor. A spade is a spade; and useless is useless. Let us not mince words."

Morton looked away. "I would not call any person useless."

Winterman shook his head. "You are a sentimentalist, Doctor. It doesn't matter what you decide. Nature decides. Gaea. Natural selection. She tests us constantly for fitness. Those who fail the test drop by the wayside. Heartless? Perhaps; but then Nature *is* heartless. You or I may not care for the process; paste over it with sticky, human emotions. We may mourn the passing of some vestigial organ, species or person; and even mount some well-intentioned, but ultimately futile program to halt the process. In the end, however, Nature always wins."

"And you, I suppose, like to be on the winning side."

"Of the two possibilities, I find that the more amenable. No one likes to lose."

"That wasn't what I meant."

"No?"

"No. I mean that if Nature always wins in the end, She needs no assistance from us."

"I see." Winterman felt a moment's unease. *Did Morton know?* Impossible. She had only arrived today. No, she was merely reacting to his opinions. He should not have spoken so freely in front of her. Most people refused to face the harsh realities of life, the ruthless winnowing that Gaea insisted upon. They were too sentimental. He had often thought that sentimentality itself was a weakness; a trait ill-suited to living in harmony with Nature. "Advaydy shew chosen," he repeated, returning the discussion to the language lesson. "Advaydy means 'useless,' then?"

Morton hesitated; then accepted his verbal lead. Winterman could see the distaste on her lips, in the corners of her eyes. So what? He was not in business to be liked; even by attractive women.

"No," she said. "It is the entire phrasoid that must be translated; not the individual words. *Adveidy*—" She emphasized the pronunciation. "—means a 'role or function.' *Ch'sen* means 'the attribute of existing.' *Shu* is the general negator. So the phrasoid is literally 'role or function non-existent.'"

"I see." Winterman folded his hands as if at prayer. Sixteen forms of the basic word, she had said. The vowels modify

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the basic word. Then 'adveidy' is a variant form of . . . "Tell me, Dr. Morton. What does, ah, 'dvd' mean?"

She bit her lip, and the cherry color brightened under the pressure. " 'Dv'd' is a person," she said. "An individual."

"Useless people," Winterman said. He said it slowly. His tongue and lips shaped the phrase carefully. "Adveidy shu-ch'sen." He made a deliberate effort to exorcise the phantom vowels that his throat insisted on. "Thank you for setting my mind at ease on Hraani thinking," he said, and rose from the board table.

Morton sat for a moment longer, watching him. Then she pushed her chair back, picked up her briefcase and stood. Winterman took her hand briefly, noting how firm her grip was.

She walked to the door, but paused with her hand on the knob. "Mr. Winterman, I am not sure that I *want* to set your mind at ease. I've told you that *B' niirë* contains words for 'bargain' and 'honesty.' That does not imply that the individuals you plan to deal with will themselves be *esygl x'riit,* honest bargainers. Nor does it imply that 'an honest bargain' means the same thing to them as it does to us."

With the door closed firmly behind her, Winterman swivelled in his chair and gazed toward the window. He leaned his elbows on the arms of the chairs and steepled his fingers together. So, the Hraani word for 'function' was a modified form of the word for 'person.' Winterman smiled. Alien? Why, the Hraani were no more alien than he was.

* * *

I: THESIS

Winterman held his coffee cup in his hand and sipped from it, from time to time, as he watched the swarms on the street far below. Not so much the busy ants, going about their affairs—not the bankers and messenger boys and Met Ed repairmen—but the others. The ones who sat in the alleyways and the recesses of the buildings, like rocks or debris in a flowing stream. Work required movement—that was basic physics—and there were too many figures down there blocking movement. Not simply resting, no. They were not in motion at all. Not *going* anywhere, and impeding those who were. It would be better if . . .

The muted echo of a police siren filtered up to him from the distance and the scum on the street began to drift casually in the opposite direction. Winterman grunted without humor. Stimulus and response. It was almost as if he were observing some sort of bacterial culture. Some organisms groped toward the light. Phototropic, wasn't that the term? There should be a word for an organism that shrank from police sirens.

Failures, he thought. Parasites. Useless, and worse than useless. They were dangerous. A disease, a cancer, eating into the body of society. Hanging around the fringes, feeding off of us. Selling drugs or sex—selling disease, really. Or begging for handouts. Producing nothing of lasting value themselves. Darwin was right. Survival of the fittest improves the breed. But what happens when the unfit are supported, pampered—dammit, even encouraged?

Degeneracy, that's what. So that decent women could not walk the streets

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without fear of rape. So that good, productive citizens could be caught in the crossfire of a gang war. So that passengers could be jeopardized because the motorman or pilot is high. That oil spill up in Alaska. The first one; the big one. When had that been? '90? '89? The skipper had been an alky, hadn't he? Another parasite. And look what had happened: fisheries ruined, the shoreline, the wildlife. Millions diverted to clean-up and repair instead of income. Yo-ho-ho and a bottle of rum.

He drank the rest of his coffee and placed the empty cup and saucer on the credenza. He checked the time with a quick twist of his wrist. It was 10:50, and he had set the meeting up for eleven. *They* should be here by now. He thrust his hands into his pockets and began to pace.

Things had been different in the Corps. No human parasites there; no "useless people." Those had been weeded out quickly and efficiently by the jungle, by the enemy, or by fellow marines. Everyone had done their part; helped each other survive. Those who wouldn't pull their weight hadn't lasted long. Bullets. Booby traps. Poisonous snakes. Endless mangrove swamps of steaming moss and soft mud sucking you down. . . . There were plenty of ways to buy it when your buddies didn't look out for you. At Bluefields . . . Well, Bluefields had been bad. And Greytown. And Monkey Point. The confusion of the Sandinista counterattack. The screams and shouted orders. Men darting this way and that. The mortar shells raining dirt and fire left, right, behind. The flash turning the night a brilliant white. Sergeant Oakes—

His intercom buzzed.

"Yes, Janet?" he asked from his post at the window. The circuits were voice-activated. He folded his arms across his chest.

"Mr. Winterman?" (Winterman heard the catch in her voice.) "You have some Hraani visitors. They just now stepped off the elevator."

He checked the time—It was 10:59:55—and smiled. Punctual. Efficient. Courteous, too. They could have 'beamed down' directly into his office, but had chosen to materialize in the closed elevator car and arrive like normal human visitors. He patted his vest pocket, felt the folded paper within. *Adveidy shu-ch'sen*. He thought he and the Hraani would see eye to eye on a great many issues.

One hran sported the silky, blue-green needles and the other, the broad, flat "oak leaves" that distinguished the two major Hraani races. One furry; one flakey; both decked out in flamboyant uniforms, looking around at their surroundings like tourists. Their rolling eyeballs, coupled with the stiff formality of their carriage, gave the Hraani a perpetually comic appearance. Winterman caught his lower lip in his teeth to keep from laughing.

There was a third visitor with them; and Winterman did smile when he saw who it was. "Hey, Johnny," he said. " 'What's the use?' "

It was hard to think of Johnny Starbuck (of Las Vegas and Atlantic City) as a hran. The beachcomber had lived on Earth for so long—his face and his antics, and especially his famous tag line, so familiar from his late-night tel-

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evision show—that he seemed almost a native. He sported a gold lamé leisure suit, unzipped to show his furry chest down to where a navel should have been, and his neck and arms were heavy with gold rings and chains. A familiar, clownish figure. Half the country 'went to bed' with him five nights a week.

Janet had followed them in with a barely-maintained professional aplomb. She tried to look at Winterman and the Hraani at the same time. "Will you require Dr. Morton?" she asked.

Winterman waved a dismissal. "No, we won't need her. I asked that the Hraani bring their own interpreter, and . . . " A smile. "Look who they brought!"

Janet blushed. "I know. Do you think he would give me his autograph?"

Winterman nodded and Janet pressed her appointment book on the TV star. Johnny looked at the book, then at Janet; then he rolled his eyes around in his head. "What's the use?" he said and Janet laughed and clapped her hands. The two Hraani officers looked on while Johnny signed the book, in both English and B'niirë characters. Their faces were unreadable. Dog faces. Bear faces. Like both. Like neither.

When Janet had gone, the Hraani visitors favored Winterman with a long silent stare. In a human, it would have been considered rude or insolent; but a slow, mute appraisal, Winterman knew, was the normal Hraani greeting. Johnny always got big laughs when he used it on new guests, especially on female guests.

To be polite, Winterman returned the stare. Uniforms fascinated him and the Hraani decked themselves out in costumes that would have shamed a grand duke. They used colors, sashes, badges, stripes, ribbons, heraldic devices: a mad potpourri of emblems and styles. Human military uniforms paled in comparison. The one on the left, the furry one, wore a bright red jumpsuit thick with insignias of various colors and shapes. Shoulders, sleeves, breasts. It seemed as if every inch of the uniform contained a badge of some sort. The hran even wore a "merit badge sash" over his left shoulder—like some manic, overachieving Eagle scout. A ceremonial dagger with a jeweled hilt hung from the center of his belt. The "flake" was adorned in a similar fashion, except that he (she? it?) wore a powder blue smock cinched at the waist with a black cord.

Both Hraani reached into pouches at their belts and, with a flick of the wrist, tossed "pixie dust" into the air. The clouds glittered and winked with subtle colors as they slowly faded. No one knew why the aliens surrounded themselves with the floating, microscopic particles; but human children loved it. They would tag along after every hran they saw on the street, laughing and applauding whenever he scattered the sparkling material.

After a few minutes, the flake tossed his head like a horse. "J'wn ab'nsé ot'ngut."

Winterman smiled and, as best he could, repeated the greeting. "Jewán ábensay óatingut."

The flake hissed. Starbuck turned quickly and clasped a furry hand around the wrists of both Hraani before they could pull their daggers more than half-

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way from their scabbards. The blades shimmered in the sunlight from the window, sparkling as if they were electrically charged. Winterman backed away in sudden alarm, staggering into the sharp corner of his desk. Adrenalin jolted his body.

Starbuck spoke to them in low snarls, spits and coughs—B'niirë was not a pretty tongue—and gradually, the two Hraani relaxed, resheathed their knives and showed Winterman their empty palms. Winterman swallowed, not daring to respond.

Starbuck turned and faced him. "Hey, one dumb critter, nicht wahr? Mon Dieu. Listen: the speech of the interpreter. Query: why flap your gums, bud?"

Johnny's bizarre vocabulary and grammar had made him a big hit on the lounge circuit even before he had gotten his own show. People got a kick out of his fractured syntax; but just now Winterman wondered how well he really understood the beachcomber.

"All I—" He stopped and swallowed. "All I did was repeat their greeting."

"Deadly insult, man. Winterman stew."

"Would they really have killed me?" *Me? Ralph Winterman? Dead over a grammatical error?*

Starbuck held up his hand. The two opposable thumbs approached each other like the jaws of a micrometer. "This close," he said. "Winterman vis à vis non-Winterman. Comme çi, comme ça. Qué será, será."

"But why? I don't understand?"

Starbuck looked at him, made a very human-like shrug, and spoke briefly with his principals. The "furry" pulled a paddle from his pouch and flipped it back and forth. Three rapid clacks: the tinkling of a wooden bell. Then Starbuck led them to Winterman's two plush visitor chairs, which they studied carefully. The furry actually measured his chair with a tape measure before closing his eyes, spinning and dropping into the seat with his arms outspread. The flake watched him do it and responded by clicking his tongue rapidly. Winterman felt the sweat cool on his forehead. *We don't know these people: not at all.* Not even after all these years.

He wondered if he had been too hasty in calling for this meeting. Perhaps he should have waited; held more discussions with Morton. But, no. Hesitation was the mother of second thoughts. And Morton was too sharp. Winterman trembled to realize how much she might deduce from their one short conversation.

"Hokey doke," said Johnny Starbuck, the ridiculous caricature Vegas lounge lizard; the castaway beachcomber with the everlastingly silly grin. *And what,* Winterman wondered suddenly, *did grins mean on Hrana?*

Starbuck gestured with his hands. "A pausing in the action. Cut!" He clapped his hands together and the flake turned and looked at him with his hugely black eyes. "Their arrival," said Starbuck. "The sight of you. No badges. No rank. A pig in a poke. Their wonder. Their query: who are you? Your query back, despite their uniforms." He shook his head slowly, a human trait he had picked up. "Deadly insult." He looked briefly at his fellows, then looked away again, his eyes blank.

Winterman relaxed slightly. *I should*

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have worn my old uniform. It hadn't been a greeting so much as a demand for "name, rank, and serial number." Some things were universal. The Hraani were military and preferred dealing with the military. They wore their ranks and functions on their uniforms. Winterman wore none; so they had asked. Repeating the demand could easily be taken as an insult. "Did you explain that I don't know how to read their ranks and campaign ribbons?"

"Hraani word. Means dumbshit."

Winterman pulled his head back. Normally he did not countenance such language, especially directed at him; but under the circumstances . . . Given his own lack of facility in B'niirë, he could hardly quibble about the speech habits Johnny had picked up.

"What should I do now?" he asked Starbuck.

"Show and tell time. What's my line? Let the mystery guest sign in, please. The Importance of Being Winterman."

"They want to know all about me. Is that it?"

"Life consists of doing one's job. Nature's question."

Winterman blinked, startled at hearing his own thoughts echoed from Starbuck's dark blue lips. "That's a Hraani belief, isn't it?" he asked. "About usefulness and Nature. I've heard rumors. Drawn conclusions from some of your monologues. It's why I asked for this meeting."

"The Advocates' impatience." Starbuck gestured toward the two officers.

With Johnny's prompting, Winterman carefully explained high finance, arbitrage and LBO's. He told of his long struggle to achieve his present eminence on 'The Street.' His guests listened impassively to Starbuck's translations, asking no questions, giving no feedback. Their eyes were in constant motion, rolling in their sockets, flicking here, there. Glancing at Winterman, at the floor, even at their own arms and legs. It was not inattention. Winterman knew that from watching Johnny on his show. The Hraani seldom made lasting eye contact.

But, after he had been talking only a few minutes, Winterman was startled to notice that the flake was leaning distinctly out of plumb; and that the furry's left arm was waving as if it were caught in an ocean current.

"Big compliment," Starbuck told him when he asked. "Full attention. The strings are loose."

The explanation meant nothing to Winterman. But if that was the Hraani equivalent of nodding politely, he could accept it, disconcerting as it was. He wondered momentarily if he should return the gesture; but remembered what had almost happened following his previous sally into interstellar communication. Let Starbuck handle the interface. He had a foot in both camps.

Winterman finished his resumé and waited; but the two Hraani made no response. He turned to Starbuck. "Do they understand what I've told them?" he asked. "Do you *have* corporations and high finance on Hran?"

Starbuck said nothing for a few moments. Then he said, "*Dvaadi-q'pang-eq'panga-erds*. Our name for them."

"Good. Then they understand what it is that I do?"

"*Dv'd-q'png-ubsn*. People share

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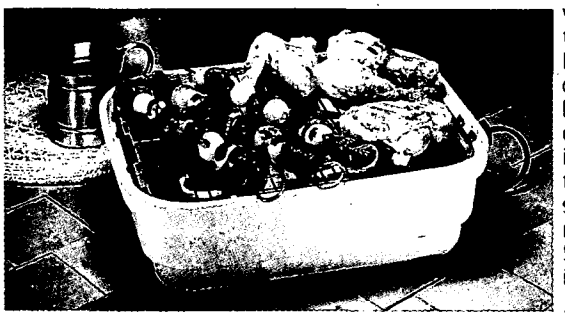

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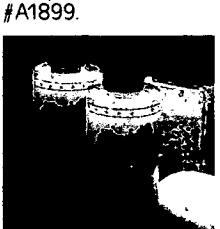

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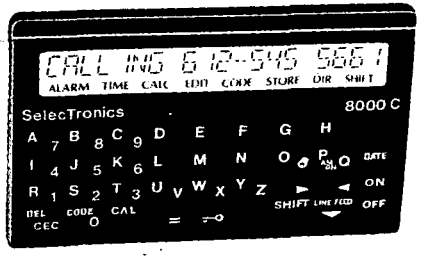

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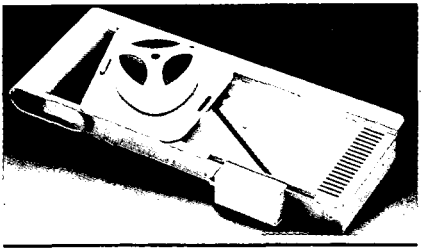

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ownership. Buy-sell ownerships. Your function: Buy-sell ownerships, en masse. Nicht wahr? Big deal; big wheel. Hey, what's the use?''

Winterman chuckled. ''You have a way of putting things, Johnny.'' Absently, he rubbed his hands together, a gesture that seemed to fascinate the two Hraani. One of them leaned forward and stared, first at Winterman's hands, then at his own. Winterman gestured toward the two. ''Now what about your friends? Are you going to introduce me?''

Starbuck tossed his head. ''No names.''

Winterman pursed his lips. ''I see. Perhaps that would be best. But . . . '' Sudden alarm. Sweat staining his shirt. ''They know who I am. Can I trust them to keep this meeting confidential? They do know the concept 'confidential,' don't they?'' He had forgotten to ask Morton that earlier. He had been too precipitous; had let his enthusiasm get the better of him. Hasty. Not his wonted modus operandi, at all.

''They are Advocates. Those-who-argue-a-proposal.''

''Lawyers?''

''Yes-no. Lawyers. Dicks. Scholars. Se-cret Aaaa-gent Man—'' (Starbuck sang that one.) ''The entirety of the wax ball.''

''But they *will* keep this confidential?'' Winterman stressed the point. He wanted no misunderstanding. ''This is privileged communication. Our own advocates are not permitted to reveal what is told to them by their clients.'' If the Hraani did not respect privity, he would have to call the meeting off. Would that be an insult to them? He pulled his handkerchief from his breast pocket and wiped his brow.

''Surprise!'' Starbuck clapped his hands, and Winterman jumped. ''Client *shu* Winterman; Client *aa* Proposal. The Proposal! What's the use, baby? It's good; it sucks. Who said it? Who cares?''

''Wait a minute. Wait a minute.'' Winterman gestured with his hands. ''Do I understand you right? It doesn't matter who makes the proposal? They will argue for it purely as an abstract principle?''

''Argue pro; argue con. Run it up the flagpole and see who salutes.'' He pointed to the flake. ''The Advocate for Change.'' To the furry. ''The Advocate for Status Quo. Opening day.'' Starbuck held a hand to his mouth, like a microphone. ''Your role: the out-throwing of the initial ball. The Advocates' volley. A duel. Choose your weapon.'' Starbuck held a paw up, one finger and one thumb simulating a pistol. He grinned. ''Winner *eq'png adveid.* Forms company. Sells stock. Starts business.''

''And my name stays out of it entirely?'' Winterman allowed himself to smile. Why, this might work out better than he had hoped!

He took his guests to the window and showed them the throngs on the street below. ''Do you agree,'' he said, pointing, ''that, if society is to prosper, everyone must contribute something useful?''

Starbuck conveyed this sentiment to the Advocates. The furry one looked at Winterman and stroked his sash. ''Dv'd aa adveidy,'' he said. ''Jwn ch'seno; drak T'raani.''

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"The Advocate for Status Quo agrees," said Starbuck.

Winterman nodded and licked his lips. He returned his gaze to the window. He did not look directly at the Hraani, but at their reflections in the glass. There was no way of telling how his arguments were being received. The body language was all wrong. Hyperactive eyes in stiff, awkward bodies. None of the aliens was standing plumb. They leaned; they held their arms at odd angles. What did that mean?

"There are too many humans," he said after a moment, "who contribute nothing to our society. Or who contribute harm. Bums. Criminals. Addicts. Street people. The useless. Do the Hraani have such?"

Johnny hesitated. "Sometimes," he told Winterman. "Adveidy shu-ch'sen."

Winterman suppressed a smile. He nodded, still staring out the window. "Many?"

Starbuck was silent for a long time. Winterman turned from the window and looked at him.

"Not many."

The Advocate for Change said something. Starbuck listened; touched himself on the breast. "The Advocate's query. Get to the point, mac."

"All right. The point is: What do you do with your 'advaydy shu chosen'?"

"Usefulness one-way, two-way. You scratch my back, baby; I scratch yours. Action, reaction. Tit for tat. Your tit; society's tat. No tits; no tats. The off-cutting from society." He made a snipping motion with his fingers. "The health of the whole equals the pruning."

Winterman nodded. "Pruning. Yes. An apt description." He thrust his hands into his pockets; watched the crowds on the street. "We have places where we remove such people. Prisons. Asylums. But there are too many human advaydy shu chosen; too many, and not enough places to put them; so they roam the streets. We can no longer prune them ourselves. We . . . lack the discipline these days. I have wondered . . . " He looked directly at the Advocates; at Starbuck, who stood between them and behind them, returning his gaze over their shoulders. "I have wondered whether the Hraani would contract to do the pruning for us. Take them away. Remove them from the street." He took a deep breath and let it out. There. He had said it. "That's the proposal," he concluded. "As you can see, there is nothing for me, personally. No hidden deals. No strings attached."

Starbuck said nothing. He stared at Winterman until he began to weave like a belly dancer and the furry Advocate turned and barked something and they exchanged rapid words.

"Well?" demanded Winterman. His palms were moist, and he rubbed them surreptitiously on his pants.

The two Advocates slapped their breasts suddenly. Starbuck hissed at him, "The swaying of your body. A mandatory response."

Winterman hesitated for a fraction of a second; but, recalling the Hraani's earlier touchiness, he quickly complied. He pretended he was dizzy, or drunk. "Why am I doing this?" he asked Starbuck through a clenched smile.

"Their saluting of you. The selflessness of your proposal. Yrapl aa yrapílo."

"Does this mean that they accept my

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proposal?'' His heart hammered and he leaned forward slightly.

''For the sake of argument. The winner? Who knows? Stay tuned, sports fans!''

It took only a short while to hammer out the details. Winterman wanted assurance that the Hraani did not regard children, students or pensioners as ''useless.'' The first two presented no problem. ''The potentiality of the trainee,'' Starbuck said. ''Great value.'' But the notion of retirees seemed to puzzle them and he had to explain the concept of pensions and Social Security several times. ''Amortization of personal surplus for extended use,'' was how Starbuck finally explained it.

To Winterman's surprise, the Hraani would not discuss price. At first, Winterman thought that was because they hadn't yet costed the job; but Johnny assured him otherwise. ''Public benefit,'' he said. ''On the house.''

Winterman had been prepared *in extremis* to pledge the assets of his entire company to the task. But as much as he yearned to improve the quality of life, the fact that he could do so at no cost came as a certain relief.

As the Hraani were leaving, the flake paused at the office door. He turned to Starbuck and spoke a few words, placing something into Starbuck's hand. Then he joined his comrade at the elevator.

Winterman turned to the beachcomber. ''Aren't you going with them?'' he asked.

But Johnny was staring at his palm, swaying back and forth like a willow in a breeze. His fur rose and fell in ripples, and he made rapid, high-pitched squeaks. He saw Winterman looking and held out his paw.

Winterman looked at the outstretched palm and saw a small circular patch made of a light, flexible material. The patch was white, with a blue lozenge-shaped symbol. He looked from the patch to Starbuck's face and could see nothing there that made sense.

''Dovdy ng-ádveidy-echsan,'' Starbuck said. ''Ng-echsan.'' And he resumed squeaking.

II: ANTITHESIS

Morton was waiting for him in the lobby and saw the whole incident.

Winterman breasted the tide of bums and beggars and climbed the steps, surrounded by his convoy of aides. He could see Morton ahead of him, behind the glass doors, waiting in the air-conditioned coolness. Her face was fashionably pale and the red of her lips stood out like a wound. She wore a dark, pinstriped business suit, skirt hemmed at mid-calf; and she held her briefcase in both hands, her arms forming a V across her body that accentuated the whiteness of her blouse. The morning sunlight, second-hand reflections from nearby towers, splashed a glare across the glass, surrounding her with a white-hot aura.

Winterman was so struck by the sight that he failed to notice Oakes, until the latter, sitting on the steps at his feet, tugged at his trouser cuff as he walked by.

Winterman pulled away at the unfamiliar touch and one of his aides moved to interpose himself between the boss

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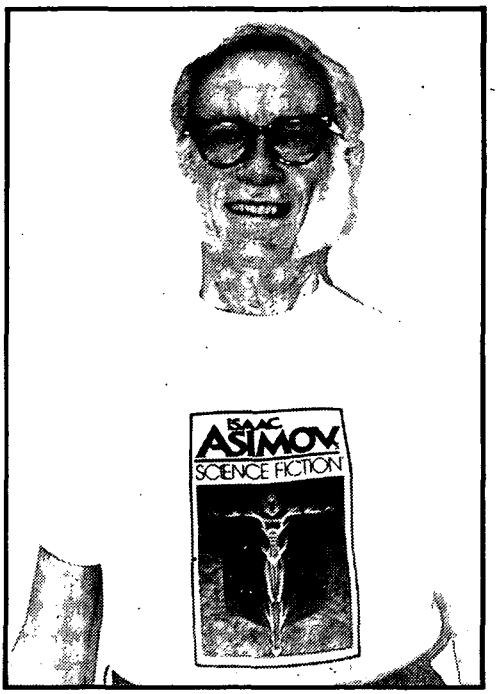

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and this unwelcome intrusion. But Winterman saw who it was and held out an arm to restrain him.

"It's all right," he said.

"Well, captain," said Oakes. "No hello for your old mess-mate?" Oakes clenched a torn and soiled paper bag in his fist.

"Good morning, sergeant. I'm afraid I was distracted."

Oakes's grin split his face, showing his blackened, yellow teeth. He jerked a thumb over his shoulder. "Yeah, I saw her, too. She sure is a looker, isn't she? Be afraid to touch something like that, 'cause you'd leave fingerprints or smudges. Pull something out of place. Too delicate . . . no . . . " A thoughtful frown. "Not delicate. She's a hard-looking one, she is. Too . . . careful. Yeah, that's it. Careful. Look, but don't touch." He cackled suddenly. "Not like the Miskito women, eh, captain? Touched a few of them; but, Jeeze, you'd want to put a bag over their heads first. Brown and squatty, wasn't they?" He shook his head, shoved the paper bag to his face, and drank from the bottle inside. "That was 'Touch, but don't look.' Right?"

Winterman pursed his lips. He could sense his aides taking it in. Wondering. Humping bare-asses in the jungle? *Did the Old Man really . . . ?* Inappropriate thoughts, really. And it was too long a time ago to matter any more. "It will be cloudy later this afternoon," he told Oakes. "You should get a break in this temperature." He brushed with his hand at a swarm of gnats.

"Captain?" Oakes looked into the neck of the bottle hidden in his bag.

"What?"

"Forget the weather report. Take me in."

"What?"

"Take me in?" Oakes turned pleading eyes to Winterman.

"In." Winterman glanced briefly at the bright, sanitary building. "Why?"

"Because it ain't safe out here no more. It . . . People been disappearing the last couple nights. Not a sign. Not a trace. Jimmy Quick and his two girls. Nobody seen 'em. Clarence that lives over there by the bank. Gone. A dick and his push went up that alley last night at oh-three hundred. They never came back out. No blood. No screams. No sign." Oakes's hands were shaking and he set his bottle down carefully on the stone pavement. "It's like it was at the forward base, at Greytown. Remember how the government's tame *zambos* used to infiltrate the camp each night? You never knew . . . " He grabbed his left hand convulsively in his right and steadied it, hugging it to his breast. "You never knew who wouldn't be there in the morning."

Winterman smiled. "I'm sure there are no *zambos* in New York."

Oakes stabbed a finger at him. "You think I'm still sick, don't you?" he shouted. "You think I'm flashing! Well, I ain't! I tell you people are disappearing off the streets!"

Winterman pursed his lips and ran his tongue across his teeth. He looked up and down the narrow lane. *So soon?* he thought as he reached for the doors. It had only been three days since his meeting with the Hraani Advocates. Could they have decided and acted this quickly? Perhaps. They had struck him as a decisive, no-nonsense folk. Military effi-

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ciency. No time lost in foolish debates. No politics. "I'm sure nothing has happened to them. In fact, I can assure you that they have merely been 'removed' somewhere far away." Where? he wondered briefly. The Hraani Artifacts in TransPluto were immense—an embryonic Ringworld someone had told him, whatever that meant. You could lose a thousand Earths in them, let alone the street sweepings the Hraani were collecting. With a mental shrug, he dismissed the speculations. He didn't much care where the Hraani stacked the human deadwood they collected.

"Who was that man?" Morton asked when the doors had eased shut behind him. "Do you know him?" She looked once, quickly, over her shoulder at the plaza; then fell into step beside him.

Winterman looked at her. "I knew him once, a long time ago."

"Incoming, captain! Duck!"

Star shells throwing the camp into a ghastly, colorless illumination. The sewing machine sounds of assault rifles. Tiny geysers of dirt where the bullets hit. The dull, meaty thump when they hit flesh. The whistle of incoming rounds. The screams and shouted orders. Men darting this way and that. The mortar shells raining dirt and fire left, right, behind. The flash directly in front of him turning the night a brilliant white. Lifting, flying, falling. The earth rearing up and striking him across the back like a hammer. The sight of distant stars through the gaps in the jungle canopy. Sergeant Oakes's face staring down into his own—

"A long time ago," he repeated. "In another life."

"Was he a friend of yours?"

Winterman looked at her; considered telling her it was none of her business. The elevator sighed opened and they stepped inside. Winterman waved his entourage off and let the doors seal him in with Morton.

"A friend," said Winterman, watching the floor numbers light up in succession. "Yes, he was. He was my sergeant. We were in combat together. Most of us came out of the fighting without any psychic damage; but Oakes hasn't 're-adjusted' well to civilian life."

Morton's eyes shaded over and her mouth formed an "oh."

Winterman could not abide understanding from those who could not possibly understand. Morton hadn't been there, and that was that. "There was no braver man than Jonathon Oakes," he said, "when it came to open combat. But we each have our Achilles' heel, and his was the zambo attacks." *Stealthy. Never any sign. Just haul out the bodies each morning. And ask yourself why the man on your left or your right? Did they flip a coin to decide which ones they killed?* "The zambos utterly unnerved him. He wouldn't sleep at night. He became nervous, jittery, undependable. In the end, he cracked; and I was forced to evacuate him. He has not been the same man since."

"And you won't help him out now?"

"A handout isn't a helpout."

"Very glib."

"I think you are overstepping your bounds, Doctor. You should confine yourself to anthropology."

"Still, if he was your friend—"

The elevator chimed and Winterman leaned on the "doors closed" button.

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"My friend," he told her, "was a brave, practical soldier. He was sharp, both mentally and in his personal hygiene. He was *not* a bum or a drunkard. He did not sit on street corners, half-crocked and flea-infested, wheedling dollars from strangers!"

"There must be something you can do for him."

"He has to do it for himself." Winterman studied the elevator panel. He ran his finger over the Braille dots. "I did try," he said after a moment. "When he first showed up on my steps out there. I gave him a job in security. He would have been good at it. He *should* have been good. But it didn't work out."

"What do you mean, 'It didn't work out'?"

"It is time for our briefing, isn't it?" He jabbed the "open" button. The doors parted, and he stalked out without waiting to see if Morton followed.

"The Hraani," Morton told the managers at the morning briefing, "are blind."

Winterman folded his hands, fingertips to fingertips. He glanced at his staff, saw them whispering or simply looking puzzled. "Doctor Morton," he said, "I have dealt with the Hraani. They are not blind."

Morton favored him with a challenging look; one that said she dearly wanted to know what that deal had been. "Tell me," she said. "Did you notice how still and awkward their bearing was? How they constantly looked around themselves to the point we would consider rude? How, on occasion, their arms or entire body seemed to 'wander'?"

It was, of course, a rhetorical question. Winterman leaned forward on the table. "Yes. Why is that?" He was still irritated over their quarrel in the elevator; but he had hired her for her knowledge, not her personality.

"Because they *are* blind," she told him, "but in a very special way. Would you all close your eyes, please? Thank you. Now, at arm's length, bring the tips of your forefingers together. You see? You have little trouble 'finding' your fingers, even with your eyes closed. The Hraani cannot do that, because they lack a sense that we take so much for granted that we seldom notice it at all. Sherrington called it 'our secret sense.' It is the constant and automatic sensing and adjusting of the position and tone of our bodies. We call it 'proprioception,' from the Latin *proprius*, meaning 'one's own.' It is the sense by which we feel 'ownership' over our bodies. It tells us we live just behind our eyeballs." She tapped her skull with a pointed nail. "The Hraani do not have this sense. And that colors their whole outlook." She smiled, as if at a secret joke. "Literally, their 'out-look.' "

"There was something about that on PBS last year," said O'Donnell. "But I didn't understand it at the time." A few other heads around the table nodded at the recollection. Winterman waited for the answer. He preferred to let his managers ask the questions. Let them appear ill-informed. Silence was construed as understanding.

"Yes," replied Morton. "That was when we first realized how different the Hraani senses were. A neurologist

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watching Johnny's show was struck by the similarity of his behavior to that of body-blind people he had been treating. Until then, everyone assumed that he acted that way for the laughs."

"Body-blind," Winterman repeated. "An apt phrase."

"I am an anthropologist," she told them. "But that is what the neurologists have concluded. The Hraani would consider what you just did with your fingers to be a supernatural power."

"Interesting," said Gunn. "The Hraani usually make us feel inferior. It's nice to know we've got something over them. Why isn't it better known?"

"Because, as usual, people are caught up in superficialities. In photosynthetic fur, or uniforms." She looked at Winterman when she said that and Winterman returned the gaze without reacting. "We are so accustomed to the idea that we 'live inside our bodies,' " she continued, "that it never occurred to us that the Hraani did not. And, of course, the Hraani never mentioned it for the same reason. In fact, I doubt that they understand the issue any more than an eye-blind person understands orange."

O'Donnell looked up from her note pad. "I'm not sure what you meant, Doctor Morton, when you said that the Hraani do not 'live inside their bodies.' "

Morton nodded slowly. She clasped her hands behind her back and walked slowly to the window. "Body-blindness is unusual among us humans, but it does happen. There was a classic case many years ago of a woman, 'Christina,' who became body-blind while in hospital awaiting surgery. No one was ever quite sure what triggered her condition, but the results were startling and dramatic. She could not stand upright; her hands wandered. When she reached out for something, she would miss wildly. Her face became slack; her voice, flat. 'I can't feel my body,' she told the doctors. 'I feel weird—disembodied.' "

"Disembodied," Winterman repeated.

"Yes. An insightful comment. She had lost—literally—the sense that she lived within her body. She was *not* numb or paralyzed. She could feel, see, speak, move her arms. But, the 'seeing' had become something akin to watching a monitor; the 'hearing,' to listening to speakers. In her own words, her body had become 'blind and deaf to itself.' If 'Christina' had been any less the person she was, the psychological effects could have been catastrophic."

"What happened to her?" asked Vermeers. "Did she ever recover?"

Morton shook her head and turned away from the window. "No, she did not. But she eventually learned how to cope. And therein lies the only clue we have to understanding the Hraani *Weltanschauung*. Like other sense-blind people, 'Christina' learned to compensate for her loss by using her remaining senses. For the now-missing *proprio*ception of body position, she learned to substitute her visual *per*ception. She actually had to watch where she put her arms and legs." Morton demonstrated by walking toward the table, glancing repeatedly at her feet before she moved them. Winterman recognized the similarity to Hraani behavior. No wonder their eyes were in constant motion! They were constantly taking bodily inventory.

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"Similarly," Morton concluded, " 'Christina' learned to use her hearing to modulate her voice; and her vestibular sense took on more of the chore of balance. But she never lost that disembodied sensation. Everything she did became a pose; every motion, an artifice. The fact that, with practice, it became subconscious and automatic does not hide the fact that she was not 'wearing' her body, but 'operating' it."

"Like a puppeteer," said O'Donnell, "operating a puppet."

Morton thought for a moment and nodded. "That is a very good image, Ms. O'Donnell. We believe that, from the Hraani point of view, their consciousness lies 'outside' their bodies. They manipulate their bodies. The distinction between 'Christina' and Johnny Starbuck is that what for us is a dysfunction of the spinal cord is for them natural. They have evolved—what should we say?—a more intense concentration, faster reflexes. Still, they cannot rely on the unconscious and automatic coordination of their bodies that we take for granted. And when they *are* distracted or concentrating on another object, they 'lose' their limbs and posture. The reason they never apologize for knocking things over is because they take occasional clumsiness for granted."

"Oh!" That was Gunn. Morton looked at him. "I wonder. Could that be why they attend so many concerts, ballet performances, and such? I mean, you cannot play music properly if you have to decide even semi-consciously where to place your fingers for each note. And the same goes for dance. Perhaps even more so."

"Or sport," said O'Donnell. "Remember Wimbleton last year? The Hraani packed the stands. Playing tennis or basketball must seem almost supernatural to them."

Morton nodded. "That's true, and many of us in the research community believe that the Hraani are interested in us primarily because of our 'super powers.' But think—" She leaned on the table and looked at each one of them. "What might their congenital disembodiment imply about their beliefs or their value systems? Their interpersonal and social relationships? We don't know. Perhaps we *cannot* know. All that we do know is that their 'out-look' could not possibly be the same as ours, no matter what the superficial resemblances may be." And she again caught and held Winterman's gaze as she said it.

III: SYNTHESIS

It was not that the crowds on the street grew sparser. They did not. But, as the days went by, Winterman's practiced eye noted a thinning around the edges. One day there was a ragged old woman sitting on a heating grate arguing angrily with herself. The next day, she was gone. Removed quickly and quietly. There was a gang of black youths who hung around the mouth of the alleyway, shaking down passers-by for change. Day by day, their numbers grew fewer; and those who remained bore a haunted look.

All in all, Winterman thought, the pruning was proceeding quite satisfactorily.

Eventually, the media noticed.

There was a spate of articles and news bites on the sudden drop in homeless-

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ness and crime. Politicians were interviewed. (They showed how their policies were responsible for the improvement.) The police were interviewed. (They showed how efficient, no-nonsense law enforcement was responsible.) Sociologists were interviewed. (They showed how their theories and studies were responsible.) Once or twice, even "street people" were interviewed—though they told wild stories about unexplained vanishings, and goblins that appeared and disappeared in the flickering of an eye. Too incoherent, really, for the evening news.

"Good morning, sergeant," Winterman said cheerfully as he bounded up the steps.

Oakes turned wet, red-rimmed eyes to him. He squinted at Winterman for a few moments. "Oh, it's you, captain." He swayed gently on his seat on the newel block.

"You don't look well, sergeant."

"I ain't slept in days," he replied. "Can't sleep. Not with the zambos sneaking around." He swatted idly at a swarm of gnats.

"There are no—"

"Saw one, th'other day," he slurred, angry, triumphant. "Saw one. Early morning. Still dark. He was dressed in camouflage, all covered up with leaves. Never saw him 'til he was right there next to me. He pointed to my sleeve and an' said, 'What function? What function?' Just like that. Knew it was a zambo 'cause he hadda weird accent."

Winterman ran an uneasy hand across his lips. "What did you tell him?"

Oakes sat up straighter and cocked his hand to his eyebrow. "I gave him my best fuckin' USMC salute an' said, 'Gunnery Sergeant Jonathon Oakes, Fifth Marine Engineering Battalion, at yer fuckin' service.' Bastard tried to throw sand in my face. He said, 'What's the use?' Then he was gone." Oakes's tongue wet his lips. He squinted again into Winterman's face. 'I run him off, captain. I surely did. Faced up to that fuckin' zambo and he backed down."

Winterman felt ice in his belly. "You surely did, sergeant. You surely did." But . . . How long will they be fooled, he wondered? How long before they find that Oakes no longer has a productive function?

"Incoming, captain! Duck!"

Star shells throwing the camp into a ghastly, colorless illumination. The sewing machine sounds of assault rifles. Tiny geysers of dirt where the bullets hit. The dull, meaty thump when they hit flesh. The whistle of incoming rounds. The screams and shouted orders. Men darting this way and that. The mortar shells raining dirt and fire left, right, behind. The flash directly in front of him turning the night a brilliant white. Lifting, flying, falling. The earth rearing up and striking him across the back like a hammer. The sight of distant stars through the gaps in the jungle canopy. Sergeant Oakes's face staring down into his own. Arms lifting him up: carrying him. Hanging down over Oakes's shoulder gazing into the churned and smoking earth. A shell explodes and splatters them with mud and rock. Oakes staggers but doesn't fall. Jarring bounds that jostle him from side to side. Then—

Winterman made a decision. "Come with me, sergeant. I'm taking you in."

"You mean I'm being relieved?

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'S'about fuckin' time.'' He slid off the newel block and wobbled unsteadily on his feet. Winterman put an arm around his shoulder to steady him. ''Careful.'' Behind him, Winterman heard the buzzing voices of his aides. His lips formed a grim line. Let them gossip.

Winterman led Oakes toward the huge, glass doors. While he fumbled with the handles, Oakes tugged on his sleeve. ''You know, they aren't so tough, after all, captain. Those zambos. I can't believe I was ever afraid of them.''

He took Oakes up the elevator and into the executive offices, where surprised and puzzled staffers peeked cautiously around the edges of their partitions. He and Oakes brushed past Morton just as she emerged from her own office with a thick manila folder in her hands. She drew back, startled from the filthy, foul-smelling apparition, holding her arms up to avoid touching. Winterman paused.

''What's wrong, Doctor Morton?'' Winterman asked sardonically. ''You told me I should help him.''

''Yes, but . . . ''

Yes, but somewhere else. At an approved charity, perhaps. Something not so messy. Or so close. Winterman did not wait to hear her reply. He was probably not being fair to Morton. Still . . . *What if I had carried him up here on my shoulders?*

Janet sat transfixed at her desk and stared at Oakes. ''Mister Winterman!'' she said.

''Don't fret yourself about it, Janet.'' He turned to Oakes. ''That's my office through there. There's an executive washroom all the way in the back. It has a stall shower. Why don't you go wash up.'' He slapped Oakes on the shoulder.

Oakes turned and looked at him. ''It sure is good to be posted with you again, captain.'' He held out a cracked hand with torn and blackened fingernails. Winterman hesitated fractionally and took it.

''It's good to have you in the company.'' He turned back to Janet.

She had his appointment book open, her finger marking the place, but she was looking after Oakes where he had vanished into Winterman's office.

''Janet,'' he said sharply.

''Oh!'' She glanced down at the appointment book. ''Two of your meetings today are cancelled. Mr. Rollins's secretary called to cancel the A.M. conference call. And when I called Ms. Thurlow's office to confirm your P.M. they told me that she hasn't been into her office since the day before yesterday.''

''Never mind that, now,'' he told her, thinking briefly that he would have had to cancel those meetings anyway. ''Get me Johnny Starbuck on the phone immediately. Tell him it's urgent. I need to modify the proposal. Tell him that. Then have someone shop around for some clothing for Sergeant Oakes. Casual, I think, will do.''

''Yessir.'' Janet began punching buttons on her console. ''You know, I haven't cared much for Johnny the last week or so.''

Winterman paused at his door. ''Eh?''

''His show.'' She held the handset to her ear with her shoulder so she would have both hands free to flip the Rolodex.

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"His ratings are down, I heard. Somehow, 'What's the use?' doesn't sound funny any more. The way he says it, I mean. You simply don't say that about the King of England, not even for laughs."

Winterman shook his head. The ratings for *The Johnny Starbuck Show* were the least of his concerns at the moment. He strode into his office.

The door to the washroom was slightly ajar. He could hear the sound of running water. Streamers of mist curled around the edge of the door. Winterman went over and pulled the door closed, muting the rush of the water.

Oakes. He had never intended that Oakes . . . But, what else could he have intended? Useless? Of course. Oakes had given new meaning to uselessness. But, somehow, whenever he had considered the problem of the street people, he had never thought explicitly of Sergeant Oakes. A blind spot. Why? *And why the sudden urgency now?* Oakes would probably be better off with the Hraani, anyway. A new start. Sentiment? If Nature had decreed Oakes surplus, what was the point of struggling against it? Hadn't he done that once before? Hadn't that been the very lesson that brought home to him the pointlessness of appealing Nature's verdict? He glanced at the washroom door. He could just hear Oakes's voice, but could not make out the tune. Did it matter what he did today? In a week, Oakes would be back where he had found him.

Just like the last time.

The intercom buzzed. "Yes, Janet?" he spoke toward the desk.

"It's only five A.M. on the Coast," she said. Her voice sounded tinny and distant. 'Nobody's at Johnny's studio but the night guard."

"See if you can track him down through his service," he told her. *Do I have to do all the thinking around here?* "It's extremely urgent."

"Yessir." Janet clicked off and Winterman found himself standing in the middle of his office with nothing to do but wait. Wait until Oakes finished his shower. Wait until Janet located Starbuck.

He shifted from foot to foot, decided there was no help for it, and sat down at his desk. He had picked up his first briefing folder and was already refreshing himself on the details of the buyout when he remembered what Janet had told him. Rollins's secretary had cancelled.

Was Rollins trying to welsh on the deal? Six months to set this up and he—Rather than distract Janet with another task, Winterman grabbed the phone himself and punched in the call.

"Rollins, Corona and Moffett," said a pleasant voice. "May we help you?"

"Yes, this is Winterman. Let me speak to Rollins."

There was a moment of shocked silence as the receptionist came to grips with a principal placing his own call. Then he evidently decided that protocol required passing the buck. "Let me connect you with Mr. Rollins's secretary."

There was the briefest of buzzes before the secretary answered. "Mr. Rollins—?"

"No, this is Winterman, at The Winterman Companies. I am calling about the meeting we were to have this morning."

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"Oh, Mr. Winterman, I already called your office and cancelled it."

"I know that," he replied firmly. "I was calling to discover why. May I speak to him?"

"He's not in yet."

Winterman checked his watch and snorted. "Nonsense. Jim Rollins is always in position before seven and it is now after eight. The markets will open soon."

"I know that, sir. But he hasn't come in. We've called his home, but his staff says that he was gone before any of them awoke. Frankly, Mr. Winterman, we are worried sick about him."

"I see. Has there been word of an accident? He comes in on the Sawmill River Parkway, does he not?"

"No, sir. No word of anything."

"Well . . . When you do hear, I would appreciate a call."

"Yes, sir."

"Thank you."

Winterman cradled the phone slowly. He pursed his lips. His eyes fell on the second folder. The deal with Thurlow. And she hadn't been seen for two days, according to Janet. Rollins. Thurlow. Winterman had the sudden sensation of falling. He laid his hands upon his desk to steady himself. Then he pulled the phone in front of him and began pressing the quick-call buttons.

Fifteen minutes later, he had finished. Of the twenty-three other arbitrageurs and financiers that he dealt with frequently, thirteen were not in their offices as of 8:22. Six of those had not put in an appearance for two days; and four, not in three days. Winterman clasped his hands into a ball on the desktop; studied how the edges of his nails turned white.

Adveidy shu-ch'sen. Useless people.

He pressed the intercom button. "Dr. Morton?"

"Yes, Mr. Winterman. What may I do for you?"

"Another phrase, if you will." He closed his eyes and concentrated, trying to remember. "Dvaadi-q'pang-eq'pangaerds and, ah, dv'd-q'ping-ubesn. What is the precise distinction?"

"Could you repeat that? You must mean 'ubsn,' not 'ubesn.' Just a moment. Let me consult my notes." There was a short silence before she came back on. "Here we are. Dv'd, as you already know, denotes a person, an individual. Q'png is an association, Dvaadi-q'pang are individuals having the attribute of association. A limited liability company, perhaps; although the German *Gemeinschaft* or *Gesellschaft* would be closer."

"And erds and ubesn? What do they mean?"

"An initial vowel in the first declension denotes the creation of a thing. *Erds* means the creation of *rds*, or product—production; while *ubsn* means the creation of *bsn* or possessions — acquisition. So the first phrase means 'a company that produces goods' and the second means 'an individual who possesses associations.' What is this all about?"

"Then the Hraani make a distinction between possessing and producing."

"Of course. Doesn't everyone?"

There are people out there who produce nothing. They are useless. They have no function. "Ah, but the nuances,

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Doctor," he said sadly. "The nuances."

He cut the intercom and sat for a long moment, not looking at anything in particular. He felt nothing. No surprise. No outrage. He wondered if, in some secret corner of his mind, he had always expected this; intended it, even. Then he pushed himself away from the desk and strode to the washroom door and banged on it.

"Oakes? Oakes!" He stuck his head inside. "If a hran ever asks you your function, tell him that you are my scout. Tell them that you sat on my steps because you were undercover, watching for street crime that might affect me. Tell them that that was your *adveidy*." He shouted to be heard above the rush of the shower. "Do you understand me, Oakes?"

There was no answer but the hiss of the showerhead. Winterman stepped inside the washroom. "Sergeant?"

He could see nothing through the glass of the shower door. Placing an apology on his lips he pulled it open. "Sergeant?"

The stall was empty.

The water streamed from the showerhead. It splashed on the tiles, sprinkling Winterman like a priest's aspergillum. It roiled on the basin of the stall; swirled down the drain, foaming and bubbling. Winterman leaned his face against the glass. It was cold and wet. "Jonathon," he said.

IV: APOTHEOSIS

Winterman found that, at this point in his life, he could take pride in very few things; and then only in small things. One was that, after so many years, his old dress uniform still fit. He stood before the full-length mirror in the dressing room of his Connecticut estate and smoothed the creases. Carlos had done a fine job cleaning and pressing it. He could hardly smell the cedar.

He straightened the white saucer cap on his head. The eagle-globe-and-anchor affixed to the front was black brass. He wondered briefly what his household had thought of his abrupt return from the City; about his request, phoned ahead, to ready his uniform. The Man has finally snapped, he could imagine them saying.

He stared into the mirror. Into his eyes. Then abruptly, he turned and marched off.

The house was silent—he had given the staff the rest of the day off—and he waited in the downstairs living room. There were photographs and plaques lining the walls. Winterman with presidents. Winterman with sheiks and movie stars. Awards. Tributes. Winterman walked from one to the other, standing for a few moments before each.

There was a feather-like disturbance in the air. A puff. A light draft tickled his cheek.

"Hello, Johnny," he said to the room. "I've been expecting you."

He turned about-face; and Starbuck was standing there in his gold lamé leisure suit. The white badge with the blue lozenge was affixed to the right breast. On his left was a larger, square badge Winterman had not seen before. It was filled with twisting lines and slashes, like a Chinese ideogram. The Hraani ceremonial knife was snug in its scabbard, hanging from the center of his belt.

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"You're reverting to type, aren't you Johnny?"

The Hraani TV star looked blank and did not answer. He flicked his wrist and scattered pixie dust; something Winterman had never seen him do before. Tiny particles floated in the air like a swarm of gnats.

"What are you?" Winterman asked. "An adventurer? Remittance man? Ne'er-do-well second son? Never mind; it doesn't matter. I suppose slumming among the natives has its charms, but it must feel good to be accepted in civilized society again. To get back into uniform."

Johnny fingered his badges. "Ngádveidy-echsan, Winterman-dv'd. My functions. My place. My place or yours. Interpreter . . . " He touched the lozenge, which Winterman now realized was a stylized rendition of a pair of Hraani lips. "The time, the place, the purpose, n'est pas? The reading of it. My life. My pride. The knowing of me by others."

Could that much detail, Winterman wondered, be encoded in such a simple emblem? Perhaps. If one were attentive enough to notice the subtleties of size, curvature, hue. And, according to Morton, the Hraani had evolved a merciless degree of attentiveness. Still, that explained the long slow greeting. New acquaintances needed time to "read" each other's resumé. Even after the Hraani had developed higher technology, the badge-reading custom would persist; as handshaking had survived the need to prove empty-handedness. "And the larger badge?" he asked.

Starbuck stroked his breast. "Entertainer of Earthlings. New function. New niche. First badge." He pointed to a single dot in the upper right corner. "Jean le Premier. You may kiss my feet."

It struck Winterman suddenly that Starbuck did not understand much of what he said; that, like a parrot, he only repeated phrases. Black boxes. *These* words elicit *that* response. But as to what lay inside the boxes . . . The deeper meanings of the words eluded him.

Winterman smiled sadly. It was a melancholy thought to realize that Johnny had never been trying to be funny. 'What's the use?' had always been a serious question.

Starbuck tossed his head. "J'wn ab'nsé ot'ngut, Winterman."

Winterman straightened. "Ralph Hugo Winterman, Captain, 5th Engineers, USMC." He pointed to the hash marks. "Three years in the Corps." To the cross. "Marksman rating." To the fruit salad. "Mosquito Coast Expeditionary Force. Unit Citation for the assault on Corn Island beachhead. Good Conduct Medal." Winterman could feel the sweat of uncertainty on his body. "Silver Star for breaking up the Sandinista tank attack at Monkey Point. Purple Heart, wounded by a mortar shell at Bluefields. The same battle," he added, "in which Sergeant Jonathon Oakes received the Congressional Medal of Honor."

"Former Captain," said Johnny Starbuck, simply and finally.

Winterman closed his eyes briefly. He had not really expected it to work. The Hraani were very methodical, and they learned fast. But he had felt compelled for some reason he could not name to put on the old uniform. "I sup-

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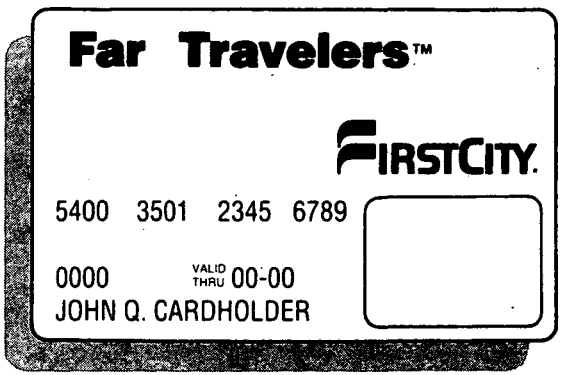

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pose you've come to take me away," he said.

"The proposer proposed. An honest bargain."

Winterman felt the shiver run through him. Echoes of Morton's warning. Second thoughts too late. Rolling downhill, picking up speed. Humpty Dumpty: When I use a word it means exactly what I want it to mean. That is not what *I* mean by success, he had told Morton. Talking to the Advocates, but not connecting, not connecting. Saying one thing; but hearing another. Person and function were two sides of the same coin. Useless people. But not Oakes! Not useless. He saved my life once. *And I was ashamed to have been saved by the likes of him.* The truth of the thought was a knife in the heart. Too proud; too proud. "What . . . ?" He swallowed. "What is an honest bargain?"

"Truth or consequences. Truth and consequences. Truth *is* consequences. Honesty *aa* the self-acceptance of the consequences." Johnny looked at him. His green fur rippled. "Achtung! The salute." Johnny stroked his breast.

Winterman smiled quietly and put his hand to his visor, pulled it down sharply.

"The greatest unselfishness," said Johnny. "The launching of the proposal at oneself. The removal of useless people from the street. Winterman the Big Man on the Street, hein?" He held a finger to his head, one thumb as the hammer, the other as the trigger. "The honor: Its delivery my privilege."

Winterman stood at parade rest. "Did you request that? To deliver my 'honor'?"

Johnny was silent. His body tilted slightly. "Be it ever so humble. Hi, honey, I'm home! Five years, T'rran. Five years here on T'rrana. The thinking of the Hraani. The thinking of the T'rraani. The arithmetic sum." A slap on the chest. "The thinking of the t'rran-hran." He paused; hissed like a steam boiler before it bursts. "I knew what your proposal meant, Winterman."

Winterman was so startled by the sentence delivered in clear English that he did not respond for a moment. When he found his voice, all he could say was, "What it meant?"

"Remove them from the streets," Johnny quoted. "Take them away. That's the proposal. Nothing for me, personally. No hidden deals. No strings attached." He stroked his breast once more.

Winterman took a breath and released it. He took another long look around his house. The richness of the woods; the softness of the carpeting. The elegance of the fixtures. Bright crystal; burnished brass. The black, polished piano in the corner, reflections in the curve of the casing weirdly distorted, as if by a fun house mirror. Now he would go to dwell among those he had always despised. The bums, the prostitutes, the addicts.

Sergeant Oakes.

He held himself straight. He owed it to Oakes, to Jonathon. To himself. It was justice, after all, for his dereliction. He would take his punishment without whining. You made pickup on your fallen comrades, dammit; and that obligation did not end when the uniform was removed. No matter how ashamed you might be to acknowledge a vagrant as your creditor. If that was mere sentiment, a futile striving against Entropy

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and Nature, so be it. "I'm ready to go now."

Johnny tossed his head. His right arm moved and the crystaline knife snaked out of its sheath. Starbuck advanced toward him. Winterman's heart skipped. *But . . .*

But what? Taken to the transPluto habitats? Why should he have believed that? No hran had ever told him so. 'Remove them.' He knew what he had really meant; what he had always meant, in that dark and frozen part of his heart that he had never dared explore. 'Remove them.' He had never inquired too closely into the Hraani plans so that he could deny, even to himself.

Still, he had to ask.

"What is the knife for, Johnny?"

"To cut the strings," Johnny told him. "No strings attached. You want nothing for yourself."

EXCURSUS

"Are you sure about that?" Cynthia Morton asked.

"As sure as I can be, Cyn," replied the voice on the telephone. "We did a complete image comparison by computer and checked it with a random visual sample. There's no doubt about it. Some of the differences are very subtle, but no two Hraani uniforms are alike. At least, among those we've seen."

Morton thanked her caller and cradled the phone. *So*, she thought. *They aren't really uniforms at all; at least, not in the sense we think of them. They are expressions of individuality, not of uniformity.* She glanced out her office window toward Winterman's office. She couldn't wait to tell the fascist bastard.

They would need a different name for the costumes. "Uniform" was not really appropriate. A new word. If "uniformity" gives us "uniform," individuality" gives us . . .

Individual.

Dv'd.

The excitement raced through her like a fire. Yes, yes! The word did not simply mean a person. It carried nuances, resonances. "That which makes a person distinct." It must refer as much to the costume as to the person wearing it!

She pulled her notebook to her and opened it to her notes on *dv'd* and scribbled hastily. She had long been puzzled by the distinction between dv'd and hrn. Why the aliens called themselves "Hraani" rather than "Dveieida." The accepted explanation was that the two words were analogous to "Terrans" and "Humans." Yet, she had never been satisfied with that explanation. She had a nagging intuition that there was an important, subtle shading that was being missed because of the psychological differences between the two species. The words were tied into concepts of personhood; and what sort of concept would body-blind "persons" have? Morton was convinced that only Terran scientists could hope to understand the dichotomy between the two species. The Hraani could barely comprehend that the dichotomy existed; and even then, the comprehension was rooted in the physical fact of Terran "super powers" rather than in the abstract notion of a "secret sense."

"You are what you do," she scribbled into her notebook. She paused a moment and read what she had written. Her stream-of-consciousness note-tak-

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ing often produced white noise, but sometimes . . .

Yes, it fit. You are what you do. The concrete versus the abstract. Dv'd. But person-ness was an abstraction; the mind experiencing itself. The Hraani concept must be more concrete. Was "person" no more than "uniform." Was that why "person" and "function" were virtual synonyms?

But each Hraani mind must experience itself as a concrete entity, as a dv'd. (She imagined a "Hraani Descartes" saying, *I think: therefore I am,* and was startled to realize that, in B'niirë, the aphorism was tautological.) That was concrete enough; but, what about other individuals? The Hraani mind could not experience others concretely.

Well, neither could humans. So what was the difference? Did it make other minds somehow less real?

Not for humans. Humans lived inside their heads, so they *knew* from direct experience that every body contained a self. I think: therefore *you* are. But the Hraani did not live "inside" their bodies. They sensed their bodies as things, possessions. As a *hrn*, she thought triumphantly, to be manipulated by a *dv'd*!

Yes. Hrn and dv'd. Body and self. Similar concepts, but rooted in utterly different perceptions.

Could any dv'd really conceive, down in the gut, that other hraani—friends, companions, acquaintances, strangers — were anything more than physical objects? Perhaps. But only as an abstract principle, generalizing from one's own self. And the Hraani were notoriously weak at abstractions.

Dear Lord, an entire race of solipsists!

What must it be like to never contact another person, save through the mechanical intermediary of two hraani? Could you make love by interfacing two machines? Reach out and touch someone, the old ads had said. But you could only do it because you *knew* that what was at the other end of the comm link was a person like yourself. Because your proprioception told you that every body contained a self. But what if other people had never been anything but voices in a diaphragm or phosphor dots on a screen?

They must be, she thought, the most lonely race in the galaxy. They cannot touch one another the way we humans can. Even though (she glanced briefly at Winterman's office) we often find it difficult ourselves. So they drape their hrn with concrete representations of their dv'd-ness, as if they were waving a flag from the window. Desperately hoping to make contact? Or was she starting to anthropomorphize? If you have never made contact with another soul, could you ever miss it?

She could see the outlines of her monograph taking shape. It would be a semial paper, one that would establish her eminence in the field. It would tie so many things together. The now moribund Hraani religions had held a common belief in transmigration of souls. Yes, of course. It would be a logical conclusion for a "disembodied" people. And the complete lack of funeral practices. Death could mean no more to them than engine failure does to a truck driver. Easy to believe when you directly experienced the body as a ma-

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chine; something to be "operated," like a puppet on strings.

She glanced again at Winterman's office, wondering where he had gone in such an agitated hurry; wondering when he would be back. It was already past time for the regular briefing. She gathered her notes together. Then she took up the current copy of the *Journal of Anthropology* and settled back to wait. When he did return, she would tell him about her deductions. She wondered if he would find them as fascinating as she did. ■

WORKSHOP PREPARES WRITERS FOR CAREERS IN SCIENCE FICTION AND FANTASY

Applications are now being accepted for the 1990 CLARION WEST WRITERS WORKSHOP in Seattle. The intensive six-week workshop prepares writers for professional careers in science fiction and fantasy.

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Please write or call for application and scholarship information: Clarion West, Suite 350, 340 15th Avenue East, Seattle WA 98112, (206) 322-9083.

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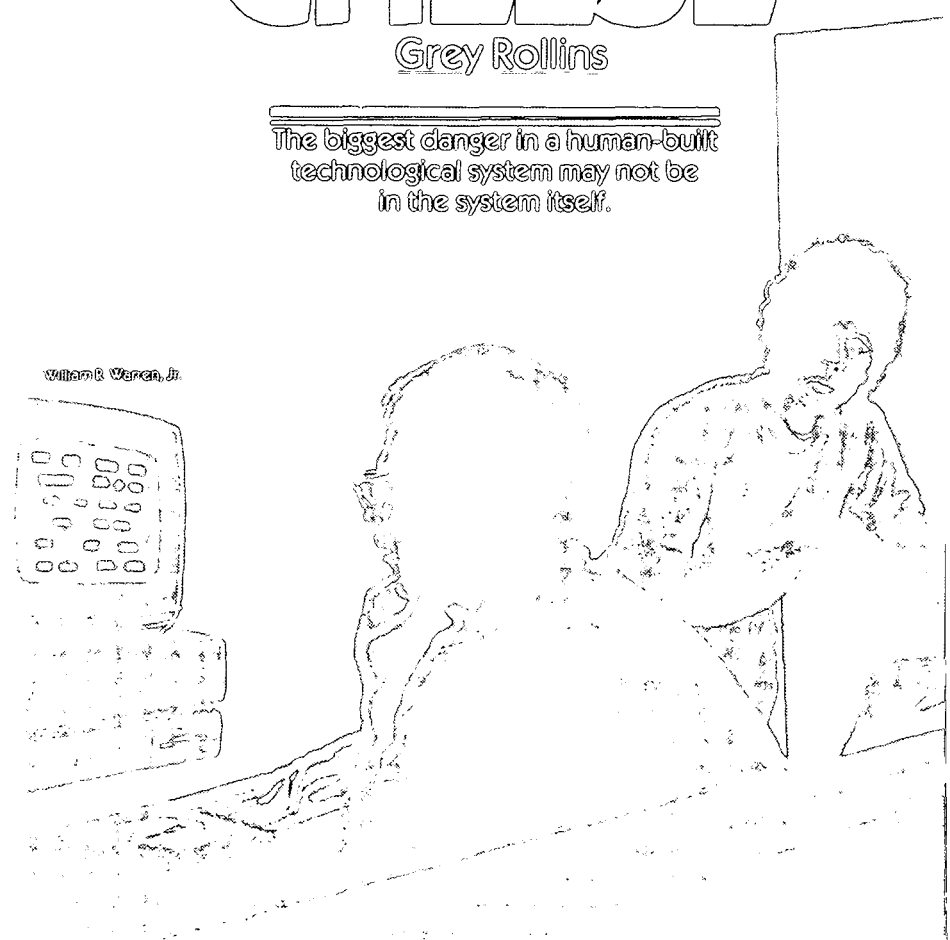
GREEN CHEESE

Grey Rollins

The biggest danger in a human-built technological system may not be in the system itself.



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Walter Abbot frowned uncomprehendingly at the computer monitor. Eyes still on the screen, he reached over and tapped a number on the communications keypad.

The screen split and a woman's strong-featured face appeared. She frowned when she saw who the caller was. "Yes, Walter?"

"Miss Haskel, the temperature in the primary cooling loop has been rising for the last three hours and I can't make it stop."

"Three hours? You should have called earlier, Walter. How much has it gone up?"

"I'm reading just over seven degrees rise in the heat exchanger," he told her.

"Hmmm . . . that's not critical yet, but it's enough to be a serious nuisance. What's the flow rate?" she asked.

Walter reached out and typed an inquiry into the computer. The display on the other half of the screen changed. His eyebrows raised. "Only 87 percent." His brow furrowed as he switched his gaze back to the other half of the screen. "But I've got the pumps at maximum, Miss Haskel, it ought to be 100 percent."

"Walter, you should always check the flow rate . . . oh, never mind, OK, I'll come in." She thought for a second. "Listen, if the pumps are wide open and the flow rate is down, then there is probably either a leak or a blockage. I want you to start trying to find out which it is, OK?"

"OK."

Suzanne Haskel sighed. In the great scheme of things, Walter just wasn't cut out to be an operator at the cooling plant for an entire Lunar city. If she had her way, he would be out the door posthaste, but there were other factors to be considered.

"I'll be there in fifteen minutes, Walter. Good-bye."

She found Walter in the pump room peering into a small inspection port set into the main return line from one of the pumps. A high-pitched scream riding above the normal drumming of the enormous pumps was loud enough to make her ears hurt. Starting down the row of gauges showing the flow of water through each of the six pumps, she stopped dead at the third. The gauge indicated that there was almost no water flowing at all.

She reached up and felt the motor casing, then snatched her hand away and examined her burned fingertips, cursing under her breath. With her other hand, she swatted the switch to turn it off.

Walter, hearing the descending whine of the tortured motor, finally looked up from the inspection port. "Oh, Miss Haskel, I didn't hear you come in," he shouted over the background thunder. His bland, round face showed no concern.

"Walter, did you not hear that pump?" she demanded angrily.

"I heard it, but I thought that it would quit if I could get the blockage cleared up. I put some sodium nitrite into the system, but it doesn't seem to be doing any good."

Biting back a sharp reply, she checked the gauges on the last three pumps, using the time to get her temper under control.

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Rather than shout, she pointed towards the portal. He nodded and started out, his slightly overweight form making him appear somewhat gawkish. She walked over and glanced at the view port. There was a dark, almost black, coating on the inside. She gritted her teeth and followed Walter out.

"So why is this stuff growing so damned fast!" Suzanne demanded of the image on the screen.

Lewis Felkner, the only water treatment specialist on Luna, replied, "Well, from the background you've given me, I see it going something like this—roughly six weeks ago, you brought the plumbing in your new ninth level online. At the same time, you introduced a goodly amount of sodium nitrite into your system as an anti-corrosive. So far, so good. The reason that sodium nitrite works is that it scavenges dissolved oxygen from the water. In doing so, it yields nitrates. Now we get to the bad news. It sounds as though bacteria were introduced into the system when the new level was brought online. Bacteria can use those nitrates as food. When the bacteria die, they in turn provide food for slime mold, which is what I think you are describing in your view port."

Suzanne started laughing bitterly. "Is that what it is? Slime mold?"

Felkner nodded. "Yes, I believe so. What's so funny about that?"

"It's just that old line about the Moon being made of green cheese."

Felkner looked puzzled. "So?"

"What grows on cheese?"

It took him a moment. "Ah . . . mold!"

"It just struck me as funny, in a morbid sort of way." She pulled at her lip for a moment. "So you're telling me that I've got slime mold in the primary loop of my water system. How the hell did it get there?"

Steady brown eyes regarded her through the screen. "I would say that there were spores in the piping when it was shipped up from Earth. The slime mold has been in there growing slowly ever since you pressured up. The final stage begins when the first patch manages to get itself glued to the inside wall of a pipe somewhere in your system. Once the stuff gets a foothold it goes crazy. Two other factors are contributing to your problem. One is that the more the mold impedes the flow of water, the faster it grows, since there is a self-cleansing action to higher water velocities. The other is that slime mold loves to be warm. The warmer it gets, the faster it reproduces . . . up to a point, anyway." He paused before adding, "Of course, your operator only made matters worse by injecting more nitrites into the system. Since this is not a corrosion problem, it could not be expected to help. In the long run it will only give the bacteria more to feed on."

Suzanne ran her fingers through her short chestnut hair. Her face was a study in exasperation. "I don't know why he did that. He does the strangest things for next to no reason at all."

"Hmmm . . . I think I know the type. I'm certain the gods have a reason for inflicting inept people on the rest of us, but I confess that I've never been able to grasp their motives." He made a sour face. "Your system is set up for triple redundancy, isn't it? How did he

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manage to get this stuff into all three systems at the same time?"

"That, at least, was not Walter's fault. I was against opening the ninth level, but I was outgunned. It is still incomplete and there are temporary bridges among the three systems in order to get sufficient water flow to various wings down there. It's been a nightmare from my point of view. Needless to say, Murphy's Law dictates that this is the time that I should get hit with something that could cross all three systems and cause such havoc."

"I get the picture. What you need is a veto clause like we have here in Crisium. Anything that is deemed unsafe can be vetoed by anyone on the central planning committee."

"We don't have anything like that here in Besselton," she said grimly. She glanced down at her sweat-soaked yellow jumpsuit. "So now we suffer."

Two hours later she took a seat near the head of a long black table surrounded by the other members of the Besselton planning committee and said without preamble, "I'm afraid we have a problem. We lost a pump at the cooling plant and the others are not going to be able to take up the load."

Samuel Tempkin, the mayor's right-hand man, was a perennial enemy. "So? You mean to tell me that you got me out of bed at three o'clock on Saturday night just to tell me you lost a pump?" Black hair swept back from his forehead and a sharp protuberance of a nose combined to give him a sleek, predatory appearance.

"It's not just that we lost a pump, Mr. Tempkin. We will need to start a phased shutdown if I can't get the temperature under control by morning."

Judy Anson, a Nordic blonde with green eyes, was her opposite number at the power utility. "What's the trouble?"

Suzanne said, "The night operator at the cooling plant ignored a problem with the water flow until it became critical. The system is being clogged by slime mold. I do not have the proper chemicals to combat a biological agent—all I have on hand are chemicals meant to retard corrosion, buffer pH, that kind of thing. I have called in an expert, but in the meantime, the ambient air temperature is likely to rise by a good ten degrees."

"I would hardly call a ten degree increase in temperature 'good,' Miss Haskel," Tempkin replied sarcastically. "Why aren't you prepared to handle this situation?"

Suzanne chose to ignore the tone in which the question was asked. "Problems with biological agents in water systems are common on Earth, but extremely rare here on Luna due to our isolation. Had the night operator called me earlier, this problem could have been handled far more easily. As it is, we're going to have a rough time of it."

"Can't you just drain the water out of the system and refill it with uncontaminated water?" Ron Thaskin, a tall, slender man representing the banking interests, asked.

"I'm afraid not. This stuff adheres to the sides of the pipes. It wouldn't help very much," Suzanne told him.

Judy Anson sucked her teeth and stared at the ceiling, thinking out loud. "At least it's a weekend, some of the

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major heat-producing industries run seven day weeks, but most shut down for the weekend."

"I know," Suzanne admitted. "I'd hate to think what we would be faced with if this had happened during the week."

"Surely there is some extra margin built into the system, Miss Haskel," Commissioner Abbot said from the other end of the table. A heavyset man in his mid-forties, he narrowly missed the aura of power he desperately wished to project.

"We normally have about 35 percent surplus capacity for safety reasons, Commissioner, but when the ninth level was opened it cut our margin down to 23 percent. When the pump went, we lost another sixth of our capacity. That, combined with the blockage caused by the slime mold. . . ." she shrugged, ". . . well, we're losing ground."

Mark Sanders, supervisor at the oxygen plant, asked, "How long before you can get the pump back in operation?"

Suzanne squeezed her eyes shut and pinched the bridge of her nose. Her voice was weary. "We let the motor cool down while we cleared the blockage out of the pump. When we tried to restart it, we found that the bearings had seized. We had another motor in place in less than an hour, but the bearings for the impeller in the pump were gone as well. That's a much more intricate job since it must be repaired, not simply replaced as we did with the motor. The current estimate is that it will be six or seven o'clock before the pump can be brought back online."

"So in the meantime we suffer because you can't do your job," Samuel Tempkin said.

Eyes flashing, Suzanne said coolly, "You may recall that I voted against opening the ninth level, at least until we could get the three systems separated from one another. You told me I was being 'childish' and voted against me."

Commissioner Abbot moved to head off what was shaping up to be a very nasty argument. "Miss Haskel, correct me if I'm wrong. Did you not say that this is due to incompetence on the part of the night shift operator?"

Sensing what was coming, Suzanne said, "I did not use the word incompetent, but had the operator in question been more . . . alert, we would not be faced with a problem of this magnitude."

"Has this operator been disciplined? Surely, this is a grave problem that will cost thousands in hardware alone. If we have to go into a phased shutdown the cost will be astronomical," Commissioner Abbot said.

Suzanne sat silently, bearing the full weight of the commissioner's stare.

"Well? I asked you if the operator has been disciplined."

"No."

"Why not?"

Suzanne took a deep breath. "The operator in question is your son, Walter."

Once back at the cooling plant, Suzanne Haskel headed directly for the pump room. A large, sandy-haired man was there, stripped to his underwear. He glanced up when the portal opened, then went back to work on the bulky two-meter-high pump in front of him.

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She tapped him on the shoulder and motioned for him to follow her out into the corridor. Once the portal was closed behind them the noise level diminished considerably.

She noted the sweat dripping from his body, but could not tell whether the body odor she smelled was his or her own. "How hot is it in there?" she asked, keeping her eyes firmly locked on his.

He glanced down at his nearly naked body. "God, it feels good to be out here." He looked up at her. "Should I pull on my jumpsuit, Suzanne? I mean, I . . ."

"I know what you mean, Harry. No, I won't make you put it back on. Can you give me some idea of how much longer it will take to get the pump online?"

He sighed heavily. "It's worse than I thought. Usually when we have a failure like this it's because one of the ball bearings fractured. You pull the cover off of the bearing housing, remove the debris, check for other damage, put new bearings in and pack them with grease. An hour and a half, maximum. That includes time to wash your hands."

"I take it that's not the case this time," she prompted.

"Afraid not. The bearings are designed to be kept cool by the water that flows over them."

"And with no water—"

"Yeah, right. When the pump rotor shaft stopped turning, the bearings weren't exactly melted, but they were hot enough to be slightly softened. They fused to the shaft. I'm having to break them loose and polish the rough spots on the shaft by hand as I go. It's only a tide-me-over job. If we're lucky, it'll hold through the middle of the week, but that shaft will have to come out and be machined before I'll guarantee that it will work for more than an hour at a stretch. Ideally, I'd like it replaced."

"How much longer do you need to get it running?"

He shrugged. "I'm almost done with the first of three bearings. If you were a religious woman, you might pray that the other two will be in better shape than the one I'm doing now. On the other hand, if you're more the betting type, I'd advise betting against it. It'll probably be after ten before we can start her up."

She reached out and gripped his shoulder. "Harry, I need that pump."

He nodded grimly. "I'll do what I can."

The control room was the nerve center of the cooling system. She flopped into an empty seat next to the operator, then looked across at him. "Where's Walter, Boner?"

Boner glanced quickly at her, then back to the board. "I sent his ass home. He was getting more nervous by the minute and it got so I couldn't work with him frittering around. You want me to call him back in?"

She held up her hands to ward him off. "No! Don't even threaten me with that as a joke." She straightened up from her slumped position. "I appreciate your coming in. I wouldn't have called, except that I had to have somebody I could trust holding the fort while I delivered the message of doom."

"Nothing I won't do for triple time."

"Triple!"

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"I came in, didn't I?"

"Oh, all right. One shift at triple won't kill me. Maybe I can figure out a way to take it out of Walter's pay." She leaned towards the terminal, squinting at the green letters on the screen. "How's it looking?"

"Pretty bad. We're still showing a steady decrease in the flow rate."

"What! Why didn't you tell me?"

"I figured you had enough on your hands without another dose of bad news. If I had called you, you would have told me just to keep an eye on it and wait for the man from Crisium to get here, right?"

"Right," she grudgingly admitted.

"OK, well, there it is. There isn't a whole lot we can do until we get the right chemicals into the system."

"I give, Boner. You did fine. I want you to call some secretaries in . . . anybody you can find. We're going to need people in the front office to answer incoming calls. The way the ambient temperature is going up, people are going to start worrying and we're going to need to reassure them as best we can. I'm going to call Judy Anson and get her to start the first phase of the shutdown. I've got a bad feeling that we're going to need it."

After apologizing for waking her a second time, Suzanne began, "It looks like I'm going to have to ask you to start a shutdown, Judy."

"That bad?"

"Worse. The pump probably won't be back online before ten and the clogging is getting out of hand." Suzanne raked her hair back out of her eyes with her fingers.

"Is there anything I can do to help?" Judy asked.

"Other than the shutdown, I can't think of anything."

"All right, I'll start phase one. I think I can promise you a 15 percent drop in load within an hour. I'll be back in touch."

Before she could even take a breath, her screen lit to announce an incoming call. Suppressing irritation, she hit the connect button.

The image of a man with penetrating blue eyes said, "My name is Edgar Rice. I'm with the *Lunar Observer*. Can you give me a statement?"

"Damn."

After an initial moment of surprise, he chuckled. "I'm not sure I'd want to print that as your official comment on the situation, Miss Haskel."

Disarmed by the twinkle in his eye, she said, "I'll make you a deal. I'll let you come over here, but you absolutely must stay out of the way and if I say jump, your head had better touch the ceiling."

"An exclusive. You've got a deal, lady." He glanced down at something below the range of the pickup. "Give me a primer so I can set this up with my editor."

"I'm in a hurry, so this will be brief. Basically, we have here a small underground city with a population of about seven thousand people. Each person's body gives off an average of something like five to six hundred thousand joules of heat per hour. Add to that the heat generated by the lighting throughout the city, heat from cooking, industry . . . you get the idea. The system we use is based on a simple heat exchanger

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concept using water as the carrier. You've seen the big black radiator fins up on the surface?"

The image on the screen nodded. "The ones in the shade of the Bessel crater wall? Yes."

"Those fins are the outer end of the secondary loop. They radiate our waste heat out into space. Without this system, or if the system isn't operating properly, the heat builds up rapidly down here. I hate to sound melodramatic, but if the temperature gets up around 110 degrees you're going to start seeing people die in here. That's one disadvantage to living in a completely controlled environment like this. We aren't acclimated to any significant changes in ambient temperature."

"Why not just let the rock around the tunnels absorb the heat?" he asked.

Suzanne shook her head. "It doesn't work that way. Rock doesn't conduct heat all that well, so in a short period of time the rock surrounding a given tunnel has absorbed all the heat it can hold, then it starts to build up in the tunnel itself. Not to mention that in both up and down directions there are likely to be other inhabited levels which are, in turn, trying to shed their own excess heat."

"OK, I've got that. So instead, you insulate the tunnels and take out the heat yourself." He looked down again, obviously making notes. "What is it that's gone wrong?"

Suzanne decided against mentioning Walter's part. Sooner or later it would come out, but she wasn't going to be the one to bring the commissioner's son into it. "The main problem is that we have a biological factor growing in our water. It's cutting the effective heat transfer rate down by coating the inside of the heat exchangers—acting as a crude insulation. It is also reducing the flow through the pipes simply by plugging them up. We also have a failed pump. It is a direct consequence of the first problem, but it is a serious enough situation in its own right to be causing us some headaches."

"What's the prognosis?"

"Fair," she said, her intonation flat.

Rice stared through the screen at her. "That bad? Are there any plans for evacuation of the city?"

"In theory it can be done. In practice, moving seven thousand people out of here in any reasonable period of time is just not a project that mere mortals could undertake. We're stuck here until we get it under control."

"What's it look like, Boner?" she asked when she got back to the control room.

The sheen of perspiration gave his black skin the look of polished ebony. "The good news is that we're only up to about 94 degrees ambient."

"That's the good news? I'm not sure I want to hear the bad news."

"I'd better tell you anyway. I think we're losing another pump. At least it looks that way from here," he said, tapping the computer monitor with his finger.

Suzanne glanced at the clock on the wall. "God, it's not even five yet. We've got a long way to go before we get out of the woods."

"And wolves on every side."

The thunder of the pumps assaulted

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her ears as soon as she entered the pump room. It was substantially hotter than up in the control room. Suzanne pulled the zipper on the front of her jumpsuit down another hand's breadth and tried to ignore the tickle as rivulets of sweat trickled down her ribs. There was water standing on the floor and a strange, heavy smell in the air. She tapped Harry on the shoulder and pointed towards the portal. He nodded and placed the wrench he was holding on a greasy rag on top of the pump casing.

His breath was coming in short, shallow pants. It took him several tries to get enough air in his lungs to speak. "I got lucky on the middle bearing. It was a piece of cake. I'm just now starting on the third one, but it looks like it's going to be the worst of the three. All in all, the time estimate is about the same."

"Boner says he thinks another pump is going."

Harry nodded. "Pump four," he gasped. "Nothing I can do, really. The same thing as three. Blockage is beginning to interfere with the cooling of the bearings."

"Where did the water on the floor come from?"

"Four is leaking a bit."

"A bit?"

He shrugged. "Guess the seals aren't able to take the heat."

She glanced down at the sweat dripping on his bare feet. "Listen, are you going to be able to hold out in there?"

"Do I have a choice?"

"I can't order you to kill yourself, Harry."

"Miss Haskel, it's going to get much worse before it gets better. I'd just as soon work while it's cooler."

"Cooler!"

"It's only 105 in there now. When it gets to 130 I'll take a break."

"You think the pump room will get that hot, Harry?"

"It'll be there by mid-morning at the latest."

Edgar Rice was waiting in her office when she got back upstairs. "Damn," was the only thing she could think of to say.

The same twinkle appeared in his eye and an infectious grin appeared. "I hope you don't say that every time you see me."

She smiled in spite of herself. "I'll give you about two minutes, then I have to get to work."

He gave her a head to toe appraisal, noting the lowered zipper on her jumpsuit and the sweat oozing down her neck. "You've been in the pump room and the news isn't good," he stated, matter of factly.

She took a deep breath, savoring the comparative coolness of the air in the office. "No, it isn't. The repairs on the broken pump are on schedule, but it looks as though we may lose another pump soon. To make matters more interesting, it's the alternate pump on the same system—what we call the B system. The pumps on the A and C systems are still holding out."

He massaged his forehead, increased in height by a receding hairline. "Any progress on the blockage?"

"There's a man in Crisium who is the only expert on such things here on

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Luna. He should be here in an hour or two."

Rice shook his head. "It sounds like some pretty raw truth for Peoria, but I guess it'll have to play."

"Peoria?"

"News is news, Suzanne. Every news service on Luna has been on this since just after you met with the rest of the planning committee. Associated Press flashed it Earthside as fast as the signal would travel through the ether. The story will be in the next edition of every major newspaper in the world. ABC had it on their early morning North American broadcast fifteen minutes ago."

"But why?"

"Miss Haskel, there are seven thousand lives in danger here. You don't think that's news?"

"Samuel Tempkin—"

"No comment."

She nodded thoughtfully. "I see. He wants me to fail, and the more publicly I fail, the better."

"All I will say is that the person who contacted my editor did so immediately after leaving your meeting earlier this morning."

Her brown eyes narrowed. "It won't work. I'm going to win this round. Then we'll see about Mister Samuel Tempkin."

Just before seven, Lewis Felkner arrived via a small charter shuttle from Crisium. Suzanne took him directly to the pump room. They found Harry slumped against the wall in the corridor.

Suzanne knelt at his side. "Harry, are you OK?"

"I'll be all right . . . had to catch my breath. Almost got the bearing back together . . . need to pack it with grease."

"You did great, Harry, you're ahead of schedule," she assured him.

"Not great . . . pump four is getting ready to cut loose."

She looked up at Felkner. "The pump room is in there. Go do your thing. I've got to initiate another shutdown phase. If you need me, get someone to show you the way upstairs." She turned to Rice. "You stay here. Find a cup and give him all the water he can drink to replace the moisture he's lost. Once he's back on his feet, you can roam again unless he needs your help with the pump."

Her office felt almost comfortable after the heat in the corridor outside the pump room. She punched the number and started talking as soon as the face appeared on the screen. "Judy, we're going to need to shut down all the way. We're about to lose another pump and the other one isn't ready yet."

Judy Anson bit her lip. "This isn't going to go over well."

"Is there any way we can evacuate the ninth level and close it off entirely?"

"It can be done, but you'll make enemies."

"I'm sure I've already made plenty of enemies—one or two more won't matter. What I want to do is isolate the three systems from each other—that means cutting the ninth level out of the loop. There's just too much bastardized plumbing down there."

"Not to mention reducing the cooling load by getting all the lights and machinery turned off. OK, I'll get to work on it, but it will take a while. In the meantime I'll put out the word and go

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to life support and emergency systems only. That will take about fifteen minutes."

The screen flashed red in front of Suzanne three times in quick succession. "Judy, I've got a priority call coming in, gotta go," she blurted and punched the go ahead button.

Mark Sanders's face appeared on the screen. "Miss Haskel, I've held off as long as I can, but this hybrid algae we use to produce the oxygen is getting too hot. It can't take water temperatures above 95 degrees in the vats and we're almost at 93 now. Some of the algae is starting to get a little dark around the edges."

"And when the algae dies off you quit producing oxygen."

"Right."

"Then we all suffocate."

"Right."

"How long to grow a new batch of algae from scratch?"

"Don't bother asking. If this stuff dies, we evacuate the city or die within five to eight hours."

Lewis Felkner came in just as Suzanne broke the connection. She turned her seat to face him. "What's the word from hell's doorstep?"

He grinned and mopped at his lean face with a pale blue towel. "I don't honestly know how your maintenance man has stood it as long as he has. I believe that's the hottest I have ever been in my entire life." He breathed deeply and fanned at his face with his hand. "I'm introducing two hundred liters of isothiazolin into the system as a first shot—I'll need to add more later. Within six hours it will kill the majority of what's in there, but it'll get much worse before it gets better."

"Why?"

"As the slime mold dies, it will peel off the inside walls of the pipes in sheets. Your strainers are going to have to be cleaned constantly to stand even a remote chance of staying ahead of the buildup."

"Oh, God."

"You asked."

"That wasn't the answer I wanted to hear."

Lewis laughed sourly. "I'm in the business of diagnosing water problems, Miss Haskel, not handing out glad pills."

"All right, all right, you've made your point. Now all I have to do is hope that pump four hangs in there a little longer."

Just as she walked into the control room, the lights flickered once and came back on dimly. She glanced up, then back down at Boner. "Make sure that the computer and all the control circuits still have full power. I'd hate for someone in the power station to have hit the wrong circuit breaker."

He prodded at the keyboard, then watched the screen intently. "Self test comes back OK. Looks like they got the right switches." He twisted and looked up at her, an impossibly wide grin splitting his face. "I'm gonna enjoy being rich."

"Uh oh."

"Yeah, you guessed it. There's that little line in the manual that says that an employee who works shifts back to back gets double money. And since I was already at triple time. . . ."

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Suzanne held up a hand to stop him. "I couldn't talk you into going home, could I?"

Another grin. "No way."

She sighed. "Boner, you'll be the death of me yet. OK, you can stay."

The portal opened behind them. When Suzanne turned, she saw Walter and his father, Commissioner Abbot. Feeling her muscles tense, she made a conscious effort to relax. "What can we do for you, Commissioner?"

"He realizes that it's weak compared to the magnitude of the problem, but Wally wanted to apologize for not. . . ." Commissioner Abbot's words froze to his tongue when he saw Edgar Rice, who was listening avidly. He changed his tack immediately. "This could not possibly have been Wally's fault. Surely there is no way he—"

Boner's voice cut him off like a knife. "Pump four just died! We're losing pressure on the B system. It must have blown a seal when it went."

Feeling a surge of reckless anger come over her, Suzanne turned back to Commissioner Abbot. "Walter has done enough damage for one day. I'll thank you to remove him from the premises. I will no longer tolerate his incompetence and bungling just to appease you. Now, if you will excuse me, I have to see what I can do about this pump."

"He can't possibly be blamed for this. He wasn't even here!" Commissioner Abbot protested.

"No, but he allowed the conditions to develop that caused it to fail." She swept past him without waiting for his reply.

The heat in the pump room was almost a solid thing. Hot, murky water lapped at her ankles as she stepped over the raised sill of the portal. The humidity in the room was so high that the air was hazy.

Harry glanced blearily at her from where he lay on his back, using a thin steel blade to smear grease into the bearing. "Almost got it," he called hoarsely. "I shut the valves on pump four as far as I could. That crap in there won't let them close all the way."

Suzanne glanced at the gauges. "We're going to get air bubbles in the system if we can't get it under pressure soon," she shouted back over the background noise.

"Five more minutes," Harry yelled, his face red from exertion and the heat.

"What can I do to help?"

"I think there's a length of two centimeter pipe over behind pump six. See if it will give you enough leverage to close those damned valves."

Suzanne found the meter-long piece of pipe easily enough, but could not find a way to lace it through the spoked wheel that closed the valve.

A voice spoke from behind her. "Here, let me try something."

She turned and saw Edgar Rice. He took the pipe from her and placed it over his knee. Straining, he bent the end so that it stuck out at a right angle. This he fit in between two of the spokes on the wheel and braced the long arm against the protruding handle. With the extra leverage, the valve closed.

"Now get this one," Suzanne told him, pointing to the valve which closed off the output side of the pump.

As Rice closed off the second valve, Suzanne turned to find Lewis Felkner

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turning a ratchet wrench to tighten down the access panel on pump three. Harry was staggering towards the portal. Felkner glanced up. "I'm familiar enough with this model of pump to at least get the cover plates back on. I told Harry to go back up to your office where it's cooler."

Suzanne stood by the switch for the pump. When Felkner nodded to her, she punched the button. As the motor came up to speed, Harry paused at the portal, one hand on the wall to support himself. She stared at the gauge until it indicated that the pump was taking as much of the load as could be expected, then turned and gave Harry a thumbs up. He nodded and went out into the corridor.

When they got back into the control room, Edgar Rice asked, "What's our status at this point?"

"In computer simulations we have run in the past based on assumed mechanical failures, it was projected that we could make it on one system as long as the city was shut down. Since then Besselton has grown. We also did not foresee that the systems would be crippled by slime mold. It could turn out to be a very dicey proposition."

Rice nodded. "I guess it's time for me to earn my keep. If you don't mind, I'd like to borrow your office for a few moments in order to file an update on the situation here."

Commissioner Abbot's voice came from the gloom in the corner of the room, "Mr. Rice, I would like to ask that you clear anything that you intend to submit to the news services with me before you turn it in."

Boner swivelled in his seat. "Why? So the rest of Luna doesn't find out that your son is an idiot who put the entire population of Besselton at risk?"

"I hardly see how it can be claimed that Wally caused this problem. It seems to me that—"

Boner interrupted him. "Commissioner, this system keeps a record of everything that goes on, twenty-four hours a day. A little while ago I called that record up on the screen and read through it. Your son came on shift at eighteen hundred hours . . . six o'clock last evening. At just after seven, the first warning message was displayed on the screen here. It informed Walter that the flow rate was dropping in the B system. His only response was to increase the pump rate to compensate. The A and C systems gave warnings together at about seven thirty. He increased the pump rates on those systems and shut off the warning system entirely. That in itself is justification for immediate dismissal and possible legal action. You never turn off the warning messages on a life support system for any reason. Ever."

"I'm sure it was an accident. Wally would never—"

"Sorry, Commissioner, but no way. It requires a complex sequence of commands to turn off the warnings. In addition, the computer asks you repeatedly if you are certain that you want to bypass those safeguards. Your son answered yes to all of them."

Commissioner Abbot turned to Suzanne. "Is this true?" he asked in a tone midway between pleading and belligerent.

She nodded. "I haven't had time to

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go over the console log, but the rest of what Boner is saying is true."

The Commissioner turned to his son. "Wally? Did you actually do those things?"

Walter's reply was inaudible.

"I can't hear you, son. Speak up."

"I said 'yes,' Dad."

"But why? Didn't you know that you were endangering the lives of an entire city, including your own?"

Walter sat sullenly, making no reply other than a shrug.

"Oh, dear God. Walter, I don't know what to say to you," he said softly. He turned to Edgar Rice, his voice hardening as he spoke, "Naturally, I would prefer that you did not make any mention of what you just heard in your report."

"Sorry, Commissioner, but news is news."

Suzanne spoke up. "Edgar, go file your story—use my office. Commissioner, I asked you to take your son off of these premises earlier. I see that you have not done so. I will ask you one more time to leave, taking him with you. I do not care to take the responsibility of having him in the control room."

Commissioner Abbot started to say something, then thought better of it. He gestured for Wally to follow and headed for the portal.

After they left, she turned to Lewis Felkner. "If you don't mind, I'd like for you to help me with the strainers. Harry needs a chance to rest." She turned to Boner. "I'm not sure what to tell you except to do your best."

"Is there any other way?"

Suzanne grimaced. "Walter seems to think so."

Suzanne had trouble pulling off the heavy rubber gloves she was wearing. She threw them on the floor disgustedly. Her jumpsuit was chafing her in so many places it felt as though it was made of sandpaper. She would have bartered her soul for a chance to take a cool shower and counted it a deal well struck.

Boner looked her over carefully before speaking. "I'd say you look like a woman who is reaching the end of her rope."

She wiped sweat from her forehead with the back of her hand and stared at it morosely. "You got that right. I've only been down there for two hours, but I feel like I'm boiled all the way down to my bones. Felkner's right . . . I don't see how Harry stood it as long as he did."

"He's one tough hombre, that's for sure."

Edgar Rice walked in and stood next to Suzanne with one hand behind his back. "I just came from your front office. I thought that you might like to know that the calls seem to have peaked about forty-five minutes ago. They are declining now that most parts of the city are beginning to receive cooler air."

Boner spoke just as Lewis Felkner came in. "I've been showing a steady increase in flow rate in the A and C systems for the last hour. The B system doesn't seem to want to get any better, but it isn't getting worse either."

"Doesn't it make you glad to know that our efforts are appreciated, Suzanne?" Felkner asked. "My word, I

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believe I'll have nightmares about slime mold for the rest of my life."

"Does this mean that there's light at the end of the tunnel?" Rice asked.

"Don't get overly optimistic, but I think we're going to be all right, now," Suzanne answered.

"Good," Rice said, as he brought his hand out from behind his back. "As a small token of my esteem, not to mention a way of saying thanks for saving me from an unpleasant death, I wish to present to you a gift." He placed an ice-cold six pack of soft drinks in her hands.

Suzanne looked at him in consternation. "But these are cold! Refrigerators are classed as unessential. Where did you find a refrigerator hooked into an emergency circuit?"

Rice assumed an expression of wounded dignity. "Madam, I am a reporter! I have an obligation to protect my sources!"

"Ah, to hell with you. . . ." she said as she jerked loose a bottle. She drank greedily for several seconds before speaking again. "Someone, somewhere is technically in violation of the law, but right now they have my blessing." She pulled three more drinks loose in quick succession and tossed one each to Boner, Felkner, and Rice. "Edgar, you are a gentleman and a scholar, and I would like to ask for the pleasure of your company at dinner some night after I've had a shower," she said, brushing a sweat-drenched strand of hair out of her face.

"Accepted with honor, Suzanne," he replied.

As she set the empty drink bottle aside and pulled another loose she said, "Boner, you're probably about dead on your feet by now. I'll get someone in to relieve you if you want."

"Better dead on my feet than dead on my back," he retorted. "Besides, you're just trying to get out of paying me for a third shift."

"Dammit! I was hoping you wouldn't figure that out. By the way, what happened to Cindy? She was scheduled to come in this morning, wasn't she?"

"Uh, well. . . ."

"Boner, you scoundrel! You called her and told her not to come in, didn't you?"

"I cannot tell a lie. I didn't actually tell her not to come in. I simply made sure I told her how hot and uncomfortable and smelly and nasty it was over here. Then my native nobility came to the surface and I volunteered to work for her. She was so relieved at not having to come in that I almost talked her into paying me for my trouble."

Suzanne shook her head. "Boner, you've got larceny in your heart. I'd almost go so far as to call you dishonest."

"I'm not dishonest," Boner protested. "Just devious . . ."

"I don't think it would be wise to play cards with this man," Felkner observed, chuckling.

The screen at Suzanne's elbow lit to announce an incoming call. She reached over and hit the switch backhanded.

Judy Anson's face appeared on the screen. She had tied her hair back into a ponytail. "What's the word? My imagination tells me that it's a little cooler here, although I can't seem to muster the courage to check a thermometer. It might tell me I'm dreaming."

Suzanne shook her head. "You're not

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dreaming. Nearly all of the city should be cooling down a bit by now."

"Good. Mark Sanders just called. He wanted to know if I could slip him a little more power. His algae vats are still hotter than he would like. I told him that it was fine by me, but that I wanted to check with you first."

Suzanne thought for a few seconds. "I don't see why not. If you don't mind, I'd like to keep the rest of the city down for another two or three hours. I need as much of a head start as I can get before we start producing any significant amount of heat."

"I'll call you back in a few hours and see how you're getting along. Then we can discuss the power up sequence if everything's OK," Judy said.

After breaking the connection, Suzanne leaned back in her hair and closed her eyes. "Somebody wake me up when it's all over."

Boner said, "How about if I wake you up before it's all over?"

"Huh?" she said, eyes still closed.

"The C system is losing pressure."

"What!" she demanded, sitting bolt upright.

"I haven't isolated it yet. Give me a few—*Holy Mother!* It's a leak on the ninth level near the main feeder line."

"Who opened the ninth level back up? That was shut down hours ago!" Suzanne was already on her feet. "I'm going for some flashlights—the power is still off down there. Lewis, you and Edgar meet me at the service elevator. There's something damned odd going on here."

When the door of the service elevator opened on the ninth level, the heat flooded in along with the darkness.

"Whooo! I hadn't thought about how hot it would be down here," Rice said.

"It should take at least two or three days for this level to cool off," Suzanne replied. "The area where Boner isolated the leak should be down the cross corridor to our left," she said as she switched on her flashlight.

As they turned the corner into the new corridor, there was a faint hissing as a flood of water sluiced across the concrete flooring at their feet.

Suzanne shone her flashlight at the floor. "Jesus!"

Just at that moment there was a metallic clang from ahead of them. Suzanne broke into a run, her feet splashing up droplets that flashed silver in the beam from her light. She saw a pool of light ahead with a figure standing in it.

"Edgar, take the elevator back to level eight and find a functioning terminal. Tell Boner to shut off the pumps on the C system," she shouted as she ran.

"Aaaagh!" screamed the form under the light ahead of them. Suzanne was close enough now to make out the shape of a fire axe as it raised above the figure's head. Another clang reverberated down the corridor.

Suzanne skidded to a halt just at the edge of the wash of light from a large emergency light clamped to an exposed girder overhead. "Walter!"

"Don't come any closer!" he screamed, brandishing the fire axe at her.

"What are you doing, Walter?" Out of the corner of her eye she saw Felkner start edging towards where Walter was

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standing beside a cascade of water pouring from the joint between two pipes. Suzanne grabbed his arm. "Don't. I hate to think what he might do to you with that axe."

"But if we don't do something—"

"I know, I know. . . ."

Walter swung at the pipe again with the axe. Another clang. "I can't get the joint to break," he howled, his voice echoing down the empty corridor along with the sound of the water.

"Walter, put the axe down and let's go somewhere cool so we can talk this over."

He made a wild swing in her general direction with the axe. "Stay where you are. I'm not done yet."

"Done with what, Walter?"

"I've got to smash this pipe."

"Walter, you don't want to do that."

"Yes, I do!" he shouted and swung at the overhead pipes again. He missed and overbalanced, falling to his knees in the water.

Without thinking, Suzanne leapt on his back, wrapping her arms around his neck to get a grip on him. Walter dropped the axe and struggled to his feet, prying at her arms with hysterical strength.

Around the side of Walter's neck she could see Felkner cocking his arm back. When the punch landed, Walter's head rocked back and hit her face. Felkner hit him a second time and he suddenly went slack, dropping to the floor.

Felkner caught Suzanne as she started to fall. "Sorry about that, my dear. I think I can honestly say that's the first time I've ever hit a lady."

"Humor at a time like this. Felkner, you're a strange one," she muttered.

"Can you stand on your own? I need to get your Walter fellow's face out of the water."

Suzanne nodded and gingerly touched her right eye. It felt as though she had been hit with a rock.

Felkner bent and scooped Walter up in his arms. "Let's get back to the elevator. It's a mite hot down here by my standards."

Suzanne was sitting next to Boner in the control room toweling off the last of the water when Rice walked in. "Did I ever tell you that you were a handsome woman?" he asked.

Suzanne looked up at him, giving him a crooked grin. "Did I ever tell you that you are a gallant liar?"

"Looks like you're going to have a nice black eye," Rice observed, gently touching her face. "Have a bit of a run-in with Walter?"

"Actually, Felkner did this."

"Felkner!"

"Through Walter."

"Now I'm confused," Rice admitted.

After Suzanne had related what happened, he raised his eyebrow. "This is going to make damn good copy, but I will need to ask you a few questions when you feel up to it."

Felkner came in, looking every bit as disheveled as Suzanne. "I must say that it feels positively glacial up here after being down in level nine." He came over to Suzanne and took her hand. "I wish to apologize again for—"

"It's OK, Lewis. Let's just say that it was an experience I don't care to repeat."

He sighed, the leanness of his face

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exaggerating his woebegone look. "My reputation would be ruined if this ever got back to my wife. She would never allow me to live it down."

"Just tell her that there were extenuating circumstances," Suzanne suggested.

"Ah! You might wish to know more about those selfsame extenuating circumstances," Felkner said. "I handed Walter over to your police as a good citizen should. However, he was only semi-lucid at the time. As a matter of fact, I'm not at all certain that he was aware that he was saying some very incriminating things, indeed."

"Well?" Suzanne urged.

"Mind you, this is very rough, but if I understood him properly, the sequence went something like this. Walter had a talk with his father after they left here, wherein he admitted that he had, as you put it, bungled. Commissioner Abbot then went to Samuel Tempkin to see if the mayor's office would put pressure on Mr. Rice not to publish anything nasty about his boy, since he himself had not been able to persuade Rice otherwise. By this time, the city was beginning to cool off and Tempkin realized that you were going to get everything under control after all. Tempkin called Walter and explained to him that his goose was cooked no matter what. He then talked Walter into going down to the ninth level, opening the manual bypasses, and laying waste to one of the pipes. The bargain was that he promised Walter that he would get him off the hook if Walter would do him this one favor."

Boner pursed his lips. "Sounds as though Tempkin gambled and lost."

"That's the way I see it. Walter was just a pawn . . . expendable. His real target was Suzanne." Felkner turned to Suzanne. "Why does Tempkin hate you so much?"

"It's a long story, but what it boils down to is that I caught him cheating on his wife a couple of years ago. He never has liked the idea that I knew his secret."

"You threatened to go to his wife?"

She shook her head. "No, but having that hanging over his head was enough to make him hostile."

Rice chuckled to himself. "Well, it sounds as though Tempkin let himself get carried away by his hatred. If he had kept his head, there wouldn't have been any problem, but I imagine that Walter will be more than willing to detail Tempkin's part if it will help him in court. This is going to be some story!"

"You're going to print that?" Suzanne asked.

Rice shrugged, grinning wickedly. "News is news," he replied, and walked out. ■

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futures

Matthew J. Costello

Not long ago, I attended a large press conference sponsored by Infocom, the renowned creator of classic computer text adventures, including the Zork trilogy. They were launching their new line of state-of-the-art graphic adventures and the turnout for the conference was nothing short of fantastic. There were representatives from all the computer and video publications, of course, but also reporters from glossy mags like *People* and *Time*.

And with good reason.

Infocom staged the reception at the site of a theatrical production called *Tamara,* an interactive play now running in both New York and Los Angeles. And after Infocom's presentation, the press was invited to stay and be part of the "Living Movie". . . .

In *Tamara* (Park Avenue Armory, 643 Park Ave, NY, NY 10021), set in pre-World War II fascist Italy, the audience travels around a "villa," following whatever actor or actress they wish, from the major domo/valet Dante to the Commendatore D'Annunzio. As you enter a large hall, maids present you with a special cocktail, while a black-shirted Fascista stamps your passport, telling you to remember the date (Jan. 10, 1929) and to "Enjoy your stay at the villa."

It's recommended that you follow just one character around or risk losing the thread of the convoluted story. But most people went blithely ahead and ignored that. It was just too much fun switching around as different characters caught one's interest.

My wife and I were together for most of the evening—also a procedure not recommended—until a saucy maid with a shady past caught my eye. In the interest of getting to the bottom of things, I followed that character. I got to see her hide the chauffeur's gun just as the black shirt arrived—with another group in tow—to search for it.

(No secrets will be revealed here. In fact, I plan on going back. There are a good six or seven characters I didn't get to know at all.)

The production on both coasts offers an incentive to return, with an escalating schedule of discounts for each return to *Tamara*. Is *Tamara* a game? Well, it is described as a "Living Movie," but that appellation would seem to work as well for a normal play. The Tamara passport (*very* official looking) describes it as a "new form of three dimensional participatory and interactive playing and learning environment," and that's more on the mark. The feeling created by *Tamara* is unique. You live with the characters in real spaces. They brush past you to open a cupboard, they point a gun in your direction, they seduce and betray one another before your eyes.

But unlike theater or film, you are active . . . deciding which character to follow, trying to discern who is central to the plot, and who isn't. *Tamara* is

(Continued on page 82)

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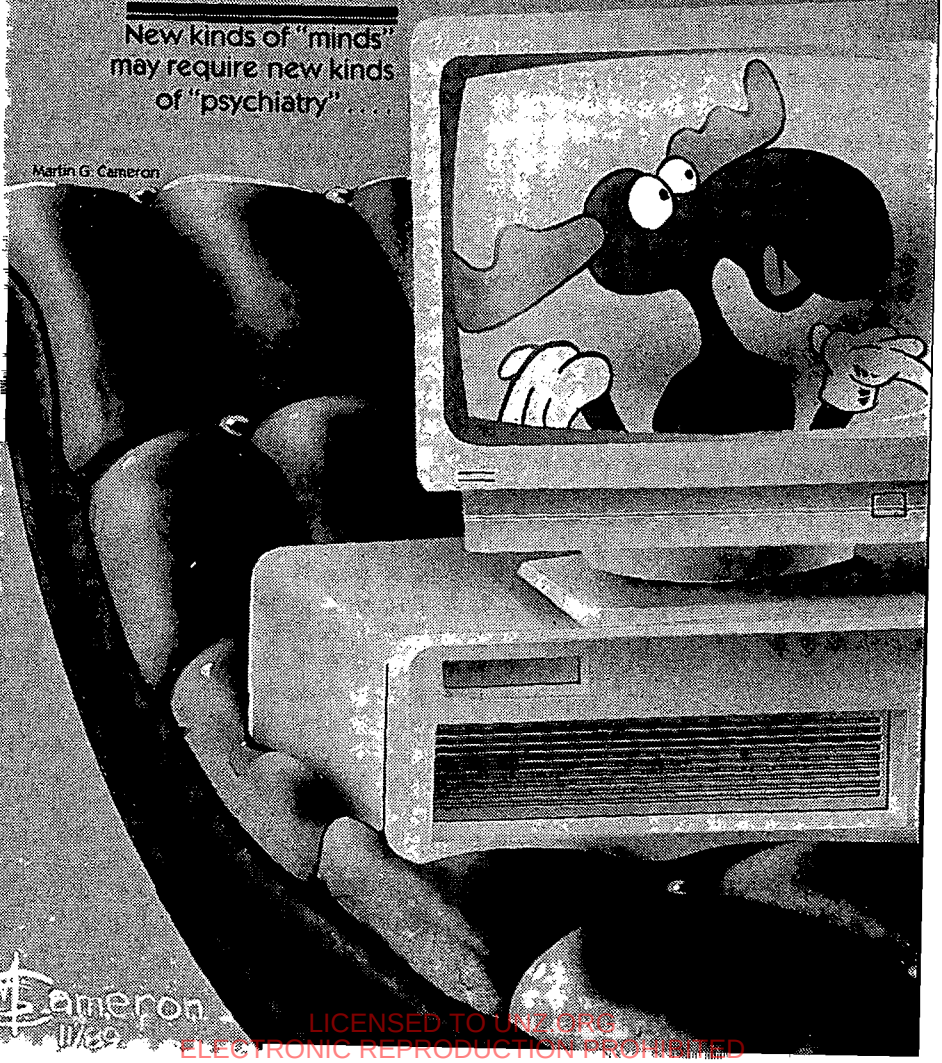
RAMUSACK TIMES SIX

Paula Robinson

New kinds of "minds" may require new kinds of "psychiatry" . . . .



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Leon Linsey rolled the antique vinyl chair back from the *Ramusack*'s primitive video display terminal. Stark, green characters glowed on the display. Not for the first time, he wished he had brought a vocal command extension to make computer access easier.

Sighing, he rubbed his eyes. He would much rather have been back at his regular job on Earth. Granted, wiring bio-implants into computers was boring, but it paid OK and was far less risky than what he was doing now. The *Ramusack*'s shipboard computer was obviously sicker than he had expected.

However, the money he made on these freelance computer jobs would let him retire before he was forty.

Ramusack was a simple orbiting vehicle, accessible by private connecting shuttle. The ship's owner was a writer of historical fiction. Marianne Onassis Smith—aka novelist Branx Ramusack—enjoyed writing in space. Ms. Smith's need for peace and quiet explained why her mid-twentieth century office orbited the Earth. Her obsession with that era explained why the computer lacked modern audio/vocal capabilities. Instead, it received orders and gave responses through primitive keyboard-and-display.

The phone call that led to his presence on *Ramusack* had come four hours ago. It seemed that the biocomputer had scared Ms. Smith into returning earthside before she could even completely outline her newest novel. She reported that the computer sometimes questioned her commands, and once or twice it even disobeyed her. It had suggested possible courses of action for the stories she wrote. At one point it even suggested she try writing erotica, and its language, she informed him, had *not* been limited to normal vocabulary. It acted, she said, "as if possessed."

Linsey had come up here assuming he would make easy money. Usually gag programs were to blame for bizarre computer behavior. Every so often programmers got bored and wrote something goofy or risqué. Occasionally one of those programs got recorded in the wrong place, and an elaborate piece of equipment—such as a ship computer—would begin to malfunction.

However, Linsey had just spent an hour scrutinizing the *Ramusack*'s software. Unfortunately, it was perfect. That meant the bio-implant was probably to blame. The *Ramusack* computer seemed to have developed a pseudo-personality.

He flicked the OFF switch and stood up in the artificial gravity. It felt good to move around. Pacing to the viewport, Linsey sat in one of the navigator's chairs. The distant stars, an incongruously large crescent moon, and oceans jeweled with cloud formations reminded him that he was, in fact, very far from home.

Linsey could see how the behavior of a pseudo-infested computer could fool a layman into thinking the machine had "come alive." The fact that bio-implants were composed of neural tissues encouraged such misperceptions.

But an implant was incapable of developing personality. The most basic biocomputer courses stressed that fact. Bio-implants were made of modified spinal cord tissues, or maybe partial

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brain stems for the more expensive types. The tissues simply weren't from the thinking part of the brain.

Linsey recalled his last encounter with a pseudo. It had formed in a massive corporate biocomputer, and its manifestations were something like the ones *Ramusack* was exhibiting. Somehow the implant malfunctioned and began to use the software abnormally. The computer had questioned commands and developed definite likes and dislikes for different users.

Debugging that computer had been easy enough. Linsey had simply unplugged the main power supply, disposed of the old implant, and wired in a new one.

He glanced at the panel that concealed the *Ramusack* implant. If this had been Earth, and not a spaceship, he would have disconnected the implant capsule without a second thought. All he'd have had to do was unscrew the panel and pull the capsule from its connections.

However, Linsey wasn't comfortable with the idea, given the circumstances. The *Ramusack* computer controlled the ship—and a pseudo could control the computer.

He sighed and went to an autodispenser for coffee. He was relieved to see that the food equipment operated independently. It wouldn't do to have a mentally disturbed computer controlling his food. For that matter, it wasn't so great to be alone up here. Linsey eyed the emergency exit hatch. Near panic rose, then ebbed when he saw that the hatch had a manual override. At least *that* was safe.

Briefly, Linsey considered calling the company to ask for technical support. Then he un-considered the idea. They thought he was in the Bahamas.

He sipped from the cup and returned to the viewport. Below, bluish atmosphere blended into black space. Linsey stared, then frowned. If he hadn't been so sure the problem was a gag program, he would have brought a replacement implant. But then, even if he'd had one, how would he have convinced the *Ramusack* to turn itself off? Such an order violated its core programming.

The only thing to do would be to call Ms. Smith and explain the situation. She could send a transport, and he'd be able to bow out gracefully.

Linsey shrugged at the thought. Of course he wouldn't get as high a fee as he expected, but he really hadn't lost anything, either. Besides, he loved spending time in orbit. He smiled slightly as a tiny meteorite burned itself to nothing over South America. Things looked so clear from up here.

On impulse, he released the manual gravity control. It took him a moment to realize he was floating six inches above the floor. His coffee began to escape into the air. Linsey laughed and caught round, brown spheres on his tongue.

A large droplet floated into the living quarters. Linsey pushed off the viewport to follow it. He was about to overtake the ball of liquid when he noticed that the *Ramusack* video display was on.

He searched to see if the computer was watching him. With some difficulty he found the camera—it had been hidden in a planter near the television set. Linsey tore out the wires connecting it to the computer.

The terminal flashed twice, then

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formed the words: CAMERA MALFUNCTION.

The pseudo was able to turn the computer on. That meant it could control at least some of the ship's manual systems.

Linsey floated toward the far end of the chamber. His breathing and heartbeat seemed even more unnaturally loud than was usual in zero gee. He reached the far wall and pushed off to sail back to the viewport. Green and blue lights on the control console blinked reassuringly. Apparently the pseudo hadn't taken the helm.

Linsey glanced at the toggles under the lights. Many of their labels made no sense to him, but a few were understandable—pressurization, fire control, and so on. He found the radio set in the center of the board.

Grasping the receiver, Linsey steadied his voice. "This is the *Ramusack*. Mayday. Repeat, mayday."

The receiver made no sound. A glance at the panel told Linsey why. The colored lights had begun to flash red, signalling computer override.

He replaced the receiver and pushed off toward the terminal. He was glad to see that the keyboard was bolted down. He put his hands to it, floated away, pulled himself back, and typed, REACTIVATE RADIO.

NO, the machine answered.

He retyped the message, and received the same response. He was about to type it again, but he had floated out of range.

Disgusted, Linsey tugged himself back into the seat and removed his belt. He looped it under the seat and buckled it over his thighs. The fit was snug but effective.

He decided to try another command. CONTACT EARTH, he typed. MAYDAY.

LIKE HELL appeared on the terminal.

"Well," Linsey muttered. Lost in thought, he began to forget his fear.

He considered how he might convince the computer that it was imperative to contact Earth. Finally he typed, I HAVE A BROKEN LEG.

REACTIVATE CAMERA, *Ramusack* responded.

Oh, great, Linsey thought. The *Ramusack* wanted to see his leg.

THE CAMERA IS BROKEN. IT BROKE WHEN I TRIPPED OVER THE TELEVISION AND INJURED MY LEG, he typed.

BULLSHIT, the computer responded. YOU COULDN'T TRIP OVER THE BOOB TUBE WITHOUT GRAVITY.

Linsey moaned. All he needed was a smart pseudo with a foul mouth. He began to be glad *Ramusack* lacked the ability to hear or speak.

The computer typed YOU SHOULDN'T LIE TO US, YOU DUMB SON OF A BI

Linsey stared at the incomplete sentence. Characteristically, pseudos gave complete, coherent statements when interacting with users. What was making this one different? Had it been distracted?

If so, then by what?

And what did it mean by "us"?

Linsey glanced toward the control panel. Blinking red lights told him it was still under computer control. Returning his gaze to the monitor, he saw that the message remained uncompleted.

He was about to punch a key to see if it would clear the screen when the monitor flashed. Letters and symbols danced in the green field.

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Abruptly the screen went blank. Then, a moment later, it prompted, COMMAND?

Linsey squinted. "Hunh?"

The screen did not change.

CONTACT EARTH, Linsey typed. MAYDAY.

LET ME ASK RACHEL.

"Rachel who?" Linsey said, unheard by the computer.

The screen flashed. Again, symbols danced and cleared.

The next message appeared: WHAT DO YOU WANT?

Linsey stared at the monitor. Was the pseudo playing games with him? It seemed unlikely. Pseudos generally had simple behavior patterns. Their ability to mimic personalities did not extend to actual self-awareness. A pseudo could only act and react as befitted the personality it copied.

An unpleasant thought struck Linsey. The *Ramusack* computer was full of novels. Not only did it contain a respectable library of 20th-century literature; it also had the entirety of Ms. Smith's works. All her notes, character sketches and backgrounds, and plot outlines were in memory. A malfunctioning neural implant would have no trouble finding a behavior pattern to adopt. Indeed, it had many to choose from. It was quite possible that *Ramusack* had multiple pseudopersonalities.

Linsey stared at the monitor, thinking. Then he tapped his lip with his index finger. Slowly, he typed, IS THIS RACHEL?

YES.

WILL YOU HELP ME, RACHEL?

OF COURSE.

Linsey held his breath. So he'd found a friendly one. He didn't want to lose it. Each time he'd asked the biocomputer to contact Earth, it had changed pseudos. Linsey decided to make a less drastic request.

PLEASE TURN ON THE GRAVITY, RACHEL.

With a jolt, Linsey's insides fell from his chest to his navel.

THANK YOU, RACHEL, he typed.

YOU ARE VERY WELCOME, MS. SMITH, Rachel replied.

I AM NOT, Linsey typed, then caught himself, horrified. He had been about to tell an insane computer that he wasn't who it thought he was!

The cursor on the monitor blinked patiently, waiting for him to complete the sentence.

He didn't want to let the computer know he wasn't Ms. Smith. He did want to keep the present, cooperative pseudo in control.

. . . SURE IF THE LIBRARY CONTAINS THE BOOK *DANIEL MARTIN* BY JOHN FOWLES, he typed, to finish the sentence he had begun.

"Rachel" replied, I WILL FIND THE TEXT. Immediately, the monitor flashed, then showed the jumbled symbols that predicted the emergence of the next pseudo.

To his surprise, however, the screen began to fill with the text of *Daniel Martin*. He hoped that keeping the pseudo busy would keep it from submerging. With a glance at the keyboard, Linsey found the key marked PRINT, and pushed it.

The buzz of the printer told him that his command had been obeyed. Green and white fanfold paper began to roll through the printer.

Linsey glanced back at the helm. The

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flashing red lights had been replaced with blue and green ones. *Ramusack* had released the helm.

He lurched for the control panel, then stopped, thinking. Then he went back to retrieve the toolbox. If he could cut the cables that connected the *Ramusack* to the helm, he could gain manual control of the ship.

He was halfway to the viewport when his feet lost traction on the floor. He began to float. The gravity was off again. Immediately, the lights on the control board blinked red.

Linsey glanced back at the terminal. The screen had begun to flash, and the printer was slowing down.

Did they fight each other for control, he wondered, and yanked the toolbox open. Nuts, bolts, pliers, and other metal objects gaily dispersed themselves into the air. Linsey fumbled after the wire snips. They bounced off his fingertips and floated toward the ceiling. With some difficulty, and not a few cusswords, he retrieved them and quickly snipped the wires that enabled *Ramusack* to control the helm.

For a terrifying second the ship went black. Three loud heartbeats later, the power came on again. Blue and green lights winked on, telling Linsey he could control the helm and, more importantly, the radio.

He was about to grab the receiver when something brushed lightly against the back of his neck. He turned. Green and white paper filled his vision. Batting it aside, he could see that the entire living chamber was lightly stuffed with fanfold paper. It took up an amazing amount of volume in zero gravity.

A glance at the nearest fold told Linsey that the *Ramusack* was no longer printing *Daniel Martin*. Instead, letters and numerals were being spat out at one character per line, quadruple-spaced.

He turned back to the radio. He would stop the insane printing after he contacted help. Pressing the button on the receiver, he began, "Hello? This is—".

Everything went black again. Even the printer stopped.

For several seconds Linsey screamed into the dead receiver. Then, regaining his self-control, he released the TALK button. Immediately the power returned, lighting up the ship and restarting the printout.

Linsey grabbed one of the piloting chairs to anchor himself. He should have realized that the *Ramusack* was far from helpless. Cutting off the biocomputer's ability to use the radio, navigational, and gravity controls did not ensure his safety. The helm wasn't the only system controlled by the biocomputer. It was clear to Linsey that at least some of the pseudos didn't want him to call for help.

Unbidden, his imagination sprung into play. Suppose a hostile pseudo altered the ship's course, then cut the power? Would anyone but Ms. Smith know he was out here? How long would it take her to report him missing? And would the government really think one life was worth an interstellar rescue?

Linsey smirked to himself. The situation wasn't that bad. If things really got out of control, he could climb into the emergency spacesuit. It hung just inside the closet. All he'd have to do is zip it up, secure the helmet, and abandon ship. Once outside the ship's

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hull, he could call for help on the suit radio.

Of course, if that happened, he wouldn't get paid—and would probably get sued for losing the ship, and arrested and thrown into jail, and he'd lose his job. . . .

He huffed. It really wasn't *healthy* to start imagining things.

Linsey stared at the monitor. Another pseudo had taken control. It only took him a moment to ascertain that it was "Rachel," who was happy to restore gravity for him. Again his guts lurched. A screwdriver that had been hovering overhead bruised his shoulder, then rolled to rest against a file as volumes of fanfold paper rustled to the floor.

Linsey kicked and tore a path to the terminal. He had no choice but to try to remove the implant, risky as that was. As things stood now, he would not be allowed to radio for help. By the time help did come —perhaps after days or weeks—there was no guarantee that one of the pseudos wouldn't be hostile to outsiders.

Linsey tried to enumerate the behavior patterns he had seen. One pseudo always questioned him and used foul language. Two tried to obey his commands, but tended to be bumped out easily. At least one pseudo would not allow him to contact Earth. And the gravity-cut and printout pranks were probably the work of yet another.

The monitor began to boil with symbols.

COMMANDEZ, the screen said.

I WANT TO WATCH BULLWINKLE ON THE TELEVISION SET. Linsey typed.

JE NE COMPRENDS PAS. *Ramusack* replied.

That made at least six pseudos.

Before Linsey could dig up much of his high-school French vocabulary, the monitor flashed. Moments later a string of words appeared that made his eyebrows rise. The foul-mouthed pseudo was back.

The screen blinked, then demanded, WHAT THE HELL DO YOU WANT TO SEE BULLWINKLE FOR?

I AM WRITING ABOUT THE 20TH CENTURY, he typed. It seemed like something Ms. Smith would say.

The screen boiled. Another pseudo appeared and asked for a command. Linsey repeated his request for the cartoon. To his surprise, the television set behind him turned on. Bullwinkle was purple rather than moose-brown, and Rocky was a chipmunk, but at least the computer had actually obeyed him.

Linsey studied the monitor while the television roared sound effects. The pseudo stayed in place for several minutes. Linsey watched carefully, hoping the present pseudo would not be bumped by any of the others.

Blinking, he realized that he had a headache. It occurred to him that he hadn't eaten since he left Earth. Kicking paper aside, he went to the food dispenser. Bean-n-Weenies and chocolate milk appeared at his command.

Linsey carried the food to the television chair. He wasn't sure whether he or his stomach grumbled loudest. Glaring at the loops and folds that rustled around his ankles, he thought of burning computer paper. The idea was tempting. Of course it was also impossible. A fire on a ship of this size would be disastrous.

He sat and ate greedily. On the tele-

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vision screen the purple moose pulled a triceratops from a magician's hat. Linsey shook his head and drank chocolate milk.

He almost choked when subtitles appeared below the cartoon characters. The words were filthy and totally inappropriate to the actual dialogue. A glance at the computer terminal confirmed that another pseudo had taken over. Linsey had no trouble guessing which one.

If that pseudo had a mouth, Linsey thought, he'd gladly have stuffed it full of wadded-up printout.

Linsey frowned. Perhaps he *could* use the printout to silence the pseudos. Hadn't he seen a light on the helm labeled fire control? That, as well as pressurization, were functions he had disconnected from the computer.

If he ignited the paper, the *Ramusack* biocomputer would try to save the ship—and itself—by gradually depressurizing the cabin. Yet he had taken pressure control away from the biocomputer. Therefore, the *Ramusack* computer would be forced to let him blow the emergency hatch. The abrupt depressurization would then rupture the implant capsule. The pseudo problems would disappear. He could call for help while the unaugmented computer maintained life support.

On the antique television, Bullwinkle was propositioning Natasha in no uncertain terms. Linsey rolled his eyes and began wadding up computer paper. He stuffed it into filing drawers, behind furniture, and into corners. Finally he shoved the largest section of the printout behind the television set.

Linsey eyed the panel covering the implant hookup. His glance went from there to the screwdriver that had bruised his shoulder. It still rested against the file cabinet. He made mental note of its position as he went to the closet and climbed into the emergency spacesuit. Turning on the suit radio, Linsey was reassured by a steady crackle.

Abruptly ship power cut off. Linsey deactivated the suit radio, and the power returned immediately. He wasn't at all surprised. Securing the helmet, he went to the nearest wad of paper. A blast from his side thruster ignited it immediately.

To his dismay, the *Ramusack* didn't seem to notice.

He went to the keyboard. EMERGENCY, he typed with some difficulty through heavily gloved fingers. COMMUNICATION WITH EARTH IMPERATIVE.

The pseudo demanded to know what the emergency was.

Linsey felt lightheaded. Had he disconnected the biocomputer's heat and air sensors when he cut the cables?

FIRE, he typed.

Behind him, Bullwinkle faded from the television screen. The monitor before him also went blank. Then the screen flashed and filled with jumbled characters.

COMMAND? a different pseudo asked.

Good God, Linsey thought. The air was becoming opaque. He was becoming keenly aware that he should have donned the spacesuit the moment he stepped on board.

FIRE EMERGENCY, he typed. COMMUNICATION WITH EARTH IMPERATIVE.

Flash. Dancing symbols.

Linsey slammed a fist on the desk.

COMMANDEZ? appeared on the monitor.

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"Jesus, Joseph, and Mary," Linsey sighed. He thought a moment, then typed, IL Y A UN FOU. EMERGENCEE. J'AI BESOIN DE PARLER AVEC LE MONDE. POURQUOI VOUS PENSEZ-VOUS FOU? the pseudo asked.

" 'Why do I think I'm crazy'?" Linsey translated, then half laughed, half sobbed. The word for fire was *feu*, not *fou*. He had just told the computer that he wanted to talk to people because there was a madman on board.

After several tries, Linsey made the Francophone pseudo understand that, no, he wasn't crazy, and yes, the ship was on fire. Once the message was understood, the pseudo promptly disappeared.

The air became gray, then black as three more pseudos followed. Each disappeared when it received the message that the ship was on fire.

The screen went blank after the last pseudo retreated. Dark bits of ash rode up and down heat currents in front of Linsey's faceplate. He began to wonder if the monitor would melt before the computer could respond to the fire.

The monitor remained blank for some time. Linsey waited until he was fairly sure no new pseudos were about to appear. Cautiously, he grabbed the screwdriver and went toward the neural implant housing. He worked on the screws for several moments without success. Then he glanced at the end of the screwdriver and roared with frustration.

At that moment he would gladly have killed the idiot responsible for Phillip's head screwdrivers.

He glanced at the monitor. Smoke and fine ash were so thick that he couldn't read the screen until his faceplate was centimeters away.

The message was simple: HELP ME.

He blinked. What was the computer doing? Had he typed that message in earlier and forgotten to erase it?

Also, why hadn't the computer opened the emergency exit? He typed in a question to that effect. The screen flashed and gave jumbled symbols, then went blank.

Not knowing what else to do, Linsey crawled along the floor until he found a standard screwdriver. He went to the housing. The screws came out easily, and in moments the implant capsule was exposed.

Linsey wondered what the pseudos were doing. A glance at the monitor told him nothing; it was lost in the smoke.

Holding his breath, Linsey reached into the chamber and closed his fingers on the implant capsule. As he began to pull it away from the connections he thought he heard, faintly through the helmet, the sound of the printer.

He yanked the capsule free. The ship went momentarily black, then regained power.

Linsey exhaled suddenly and leaned against the wall. He still had the implant capsule in his hand. Without thinking to put it down, he went to the helm and activated switches for fire control and ventilation.

The smoke cleared almost instantly. Linsey undid his helmet with his free hand and, finding the air good, allowed the helmet to drop on the floor.

Suddenly he realized how tense he had been. His hand was still fisted around the bio-implant. He relaxed it somewhat, and was surprised to see that

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he had crushed the capsule. Red liquid—a mixture of nutrients and hormones that bathed the living tissue —ran along the arm of the suit.

Suddenly he felt tremendously weak. The heavy spacesuit didn't help. Staggering to the chair by the computer monitor, Linsey fell into it.

It took a few moments before he realized that the printer had spat out a message. He leaned forward to read the green and white fanfold paper.

THANK YOU, it said simply.

Linsey looked distressed for a moment, then shrugged.

The most basic biocomputer courses stressed that pseudos were only behavior patterns. The message didn't mean anything.

He sighed, relieved, and put the bleeding capsule on a file cabinet as he unzipped his suit. ■

FUTURES

(Continued from page 71)

a mystery, and never was an amateur sleuth given a better chance to follow the culprits to pick up clues. (There's even a list of rules, called "The Ten Commandments," which cover things like following actors behind closed doors and blocking doorways.)

It would be hard to imagine someone not wanting to go back for a repeat visit.

There are a few antecedents to *Tamara* worth mentioning. . . .

David Landau created *Murder to Go*, perhaps the original murder game with actors. Last year, I attended a weekend at the Interlaken Inn, Connecticut, called "The Mystery of Magic." In the guise of a seminar on the world of magic, spirits, and astral traveling, Landau's actors staged a tour-de-force mystery. From the opening night cocktail party, where the actors were indistinguishable from guests, to the fatal performance of the "Bullet Catching" trick (done with teeth), the weekend was challenging and totally absorbing.

The Mohonk Mountain Inn (in Mohonk, New York) and author Donald Westlake have long run a pair of mystery weekends with guests like Stephen King and Lawrence Block. There's less acting in these weekends, but there's usually a witty film giving clues to the murder and the author guests as suspects. There's also a smashing theme party, ranging from Morocco (for Bogie and the '40s) to Dracula's Castle (for a Transylvanian mystery). The mountain setting is gorgeous, and these two weekends in March are booked up well in advance.

Maple Interactive Entertainment Limited, the company behind *Tamara*, has plans for a new "Living Movie," called "Tour of the Universe." This will be an elaborate simulation of a spaceport and a sight-seeing flight to Jupiter in the year 2019.

If it's half as successful as *Tamara*, it should be something really special. ■

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Margaret L. Silbar

SCIENTIFIC DIVERSIONS

"If you stare at a cow long enough, it will go away," wrote the mystery novelist Dorothy Sayers. Just as (some) cows eventually disappear into the nether-nether, so too do false scientific experiments and ideas. Recall the alchemists of the Middle Ages who thought it possible to turn lead into gold and silver, those who believed a flat Earth was the center of the Universe, those who created the irrelevant material called *ether* so that light might propagate through it much as sound travels through the air.

The reasons why science occasionally takes off in the wrong direction are manifold, illustrative, complex, and all too human. These false leads often tell us a good deal about the way science is, is not, and ought not to be done. Of course, when one is in the middle of a maze, it is often not too clear which path or branch of a path is the correct one. Would that there were only two roads, the one most and the one least traveled. But things aren't usually that simple.

Think, as did a young engineering student in western Massachusetts, how to answer the question, "Which travels faster, light or sound?" A product of the modern city, not fond of watching lightning flashes, he concluded that the correct answer was "sound." Asked by his professor for his reasons, he replied: "When I turn on the television set, I first hear the voices and *then* I see the picture."

Based on the evidence this young student used, his answer was sound. TV voices do arrive first, but only because the picture tube in the set gets in the way. In order to paint a picture on the screen, the cathode of the picture tube must first warm up to be able to emit the electrons which form its beam (which today come from "instantaneous transistors"). This takes time, giving the impression that sound arrives before light.

For your amusement (and/or edification) what follows are descriptions of some scientific diversions which took

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place in this century. None represent examples of "pathological science," that is, attempts to deliberately mislead and/or falsify data. The ideas at the time, and in their context, were "mainstream," advanced by reputable scientists. But they did lead us astray, sometimes only for a year or two, but in one case for over five decades.

The latest example of a scientific diversion is the topic of *cold fusion*. That is, the recent suggestion that two deuterium atoms can fuse to make helium, as in the Sun, but also at the relatively low temperatures of electrical batteries. As this led to this article, it seems a suitable beginning. Other topics include the collapsing Earth and landbridges, N-rays, Water II, and a presumed analogue of electric charge, the magneton.

Pro-fusion or Con-fusion?

The suggestion that the enormous power generated in the very hot interior of the Sun could be replicated at room temperatures in a small glass beaker was announced in the press on March 23, 1989. Two chemists, B. Stanley Pons of the University of Utah and his British colleague Martin Fleischmann, said they had sustained a nuclear fusion reaction by immersing rods of palladium inside platinum coils in heavy water. This *cold fusion* was said to turn out up to 100 times more energy than was put into the system by an electrical current. This process could therefore provide a clean and safe shortcut to nuclear power. As it could not be explained chemically, it was said that "a new and exotic kind of nuclear physics" was responsible.

The alleged discovery completely mesmerized a large segment of the scientific population for several weeks, leading in the US to hearings in Congress and weekly "hot line" reports to the secretary of the Department of Energy. Laboratories all over the world labored to reproduce this excess heat. Fleischmann and Pons became instant (but very reclusive) celebrities. For those caught up in the promise of essentially free power, it was even more exciting than the Apollo landings on the Moon.[1]

Because the procedure appeared so simple, almost anyone anywhere could get into the game; an enormous number of scientists from all walks of life proceeded to do so. Essentially, this is the way the procedure was said to work: Two electrodes, one of palladium and the other of platinum, are placed in a beaker filled with heavy water, which differs from ordinary water in that the hydrogen of H_2O is replaced by its heavier isotope, deuterium. The electrodes are hooked up to a battery. The electrical current separates the water into oxygen and deuterium and the deuterium is absorbed into the palladium electrode. The deuterium atoms are squeezed into the palladium's lattice-like structure, eventually fusing. The signatures of fusion are neutrons, helium, tritium, and heat. (Originally, Pons and Fleischmann claimed to have seen all of these,

[1]And not without a bit of humor. In California, one scientist, tongue in cheek, has "extracted" fusion heat from Campbell's Chicken Soup. With or without permission is unclear.

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but they have since backed down, claiming only excess heat.)

What was initially confusing was that there were in fact *two* experiments going on simultaneously in Utah. The second was at Brigham Young University, some 35 miles to the south, under the direction of Steven Jones. He claimed to have seen "the signature of fusion" (i.e., neutrons), but at a *very* low level. The BYU experiment employed electrochemical cells similar to those of Pons and Fleischmann, but used a different process. Known as *muon-catalyzed fusion*, Jones had been studying it for several years. The BYU experiment was said to provide less than one fusion reaction per second, so little as to be commercially impracticable.

In April, members of the American Physical Society gathered in Baltimore for their annual meeting. The work of both Utah groups was criticized in that neither had done "a control experiment," that is, repeated their experiments with ordinary water. That of the University of Utah also came under severe attack as their heat measurements were "suspect." The results of this were summed up in a press release[2] and in a jingle presented at the time: "Tens of millions of dollars are at stake, dear sister and brother, because some scientists put a thermometer in one place and not another."

While invited, Pons and Fleischmann declined to attend, pleading "time pressures." A month later, they also declined to participate in a Santa Fe Workshop involving some 500 scientists. This has left scientists in the position of not being able to question the two further as to their experimental set-up. Indeed, attempts to duplicate the Pons-Fleischmann results have relied on incomplete information, even, in the beginning, resorting to photos published by the press and second-hand information, such as fax messages.

Jones, who did come to the April meeting in Baltimore, brought along and displayed a twig. "Some people have claimed that this is a tree, and it's going to grow up very quickly and give us enough wood to provide all our energy needs for generations," he said. "I don't think it's a tree. . . . It's a very tiny sprout. I don't think it will grow into a tree, but I do think it will grow into a pleasant flower, a new addition to the garden of physics, which we can delight in because of its beauty, not necessarily because it provides wood, but because it gives us a picture of nature which is unique and new."

Physicists in attendance at the Baltimore meeting (and since) have felt inclined to believe that some special effect, such as quantum tunneling, might indeed allow one to circumvent the enormous electrical repulsion between two deuterium nuclei and produce "a little bit of fusion." Many at the Baltimore meeting reacted negatively, however, to large-scale fusion, as proposed by Pons and Fleischmann. At one point, some one called for "a straw vote" to see which members of a panel believed in the University of Utah re-

[2]"I have never seen such a damning press release," said one official of the APS.

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sults. Only one reserved judgment.[3] It was later, and correctly, pointed out that "science is about knowing, not about believing." (It is also worth remarking that majority opinion in science is not always a good representation of truth.)

Meantime, a few of the many groups trying to reproduce the Pons-Fleischmann experiment said they did detect excess heat. None, however, *also* produced the normal products of a fusion reaction, such as neutrons. This would seem to indicate that what is going on is a chemical reaction, but the excess heat seems greater than can be accounted for by any known chemical reaction. An impasse.

Clearly, the evidence is not yet all in. But what we have raises the very interesting question of how and when other diversions in science have arisen. Let us proceed to wrap some perspective around the cold fusion flap by looking at some other flaps from recent history.

The Collapsing Earth

Toward the end of the last century, an Austrian lifted up his eyes to the Swiss Alps and asked, whence come these gigantic hills that dot the face of the Earth? In a five-volume work, Eduard Suess proposed his theory of "The Collapsing Earth." Mountains, he said, were formed as the Earth progressively cooled, contracted, and broke up. What was once elevated collapsed, becoming the ocean basins of the next geological era. What was ocean then became dry land. Mountains were pushed up in the process, which he likened to "the wrinkling of the skin of a desiccating apple."

The theory of Suess reflected the long-standing idea of Europeans that the Earth was dynamic and ever changing. It built upon the work of Lord Kelvin, who had earlier reasoned that the primordial Earth was molten and that, as there was no known way new heat energy could be added to the Earth's interior, it must be dissipating the heat remaining from this earlier, hotter period. It was the digging of mines deep into the Earth which had provided evidence that the temperature of the Earth increases with depth. From that, one could argue it might once have been totally molten.

The explanations Suess offered, were, as Brian J. Skinner of Yale University points out, "complex and ingenious, but they were contrived." An apple wrinkles all over its surface. But mountains—wrinkles on the globe that is Earth—tend to be localized, both in space and in time. Take as an example, the Swiss Alps and the Rocky Mountains, separated by thousands of miles and millions of years.

Meantime, as the Suessian hypothesis held sway in Europe, that of "the permanence theory" of James Dana took over in the United States, its last vestiges not to be eradicated until the 1960s. Dana was something of an *enfant terrible*, having written a book at the age of 24 that is said to form the basis of modern mineralogy texts. Himself a

[3]Misunderstanding that only panel members were being polled, a piece of film aired on *20/20* shows in the audience the author waving her hand for "no."

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voracious reader, Dana later became a professor of geology at Yale. He was influenced in developing his theory by what he had seen when serving as a naturalist on an expedition aboard the USS *Peacock* to the Pacific Islands.

Dana's theory was *also* one of contraction. It, however, started with the basic premise that the oceans and continents, while fundamentally different, were nonetheless *permanent* features of the Earth's crust. To explain variations on the surface, he looked to the Moon, having recognized that lunar craters were similar to the earthly ones he had seen in the Pacific. Bumps and hollows will be formed just as "a melted globe of lead or iron . . . when cooling unequally, becomes depressed by contraction on the side which cools last." In analogy, on Earth it was contraction which produced "the (lateral) forces that arched continents upward and crumbled belts of land into mountains." The contraction, as in the theory of Suess, occurred as the Earth solidified from the primordial molten globe.

Dana considered the Earth's oceans "original." Marine deposits on the continents he explained as due to an earlier era when "the depth (of the oceans) would be too shallow to contain the seas, and consequently the whole Earth would be under water." One question he did not address was that of how and why fossils in distant places should appear alike. Fellow Americans, however, suggested the migration of organisms by ancient land connections that had subsequently sunk below the seas.

What made it clear that the idea of a collapsing Earth was but a scientific diversion?

A first clue came from the size of the Earth! Researchers out in the field had discovered in the Alps that large segments of rock had been displaced horizontally over enormous distances. If the Earth were indeed to have shriveled like an apple, it would have had to have started out as impossibly huge.[4]

Secondly, as was pointed out at the University of Chicago, there was no clear geological evidence to support the notion that the solid Earth was once molten. As early as 1899, T.C. Chamberlin made the outrageous suggestion that "the internal constitution of the atoms may be yet an open question. It is not improbable that they are complex organizations and the seats of enormous energies." Neither he nor anyone else was then aware that while a molten Earth implied that all heat was left over from creation, a new power source was available in the just-discovered phenomenon of radioactivity. It could provide a steady flow of heat from the Earth. In fact, in 1906 Lord Rayleigh had already shown that the heat produced by radioactive decay of radium in the Earth's crust is enough to account for its entire heat flow. No longer was it necessary to believe in "a cooling Earth."

The idea of a collapsing Earth fell by the wayside, but not the idea that the continents had forever existed, essentially unchanging. Remarkably, and un-

[4]Dana's theory could perhaps get around this, for no doubt in analogy to the Appalachians, he allowed mountains to form only at the edges of ocean basins.

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like in our other cases, what some 50 years later turned out to be "the correct theory" was almost simultaneously proposed by a German meteorologist.

In 1912, Alfred Wegener had suggested that the continents of the Earth drifted through the ocean basins, occasionally colliding with each other only later to break apart. He opposed "the sinking of a continent (or land bridge) because it is lighter than the material on which it rests."[5] Mountains, Wegener said, would be formed by "the creeping movement" of the earthly crust. In a no-doubt apocryphal tale, it is said that Wegener developed his theory that the continents once fit together like pieces in "a jigsaw puzzle" while watching the calving of glacier ice floes.

Wegener died in 1930 on an expedition to Greenland in an unsuccessful search for evidence that would irrevocably link the continents of America and Europe. Until the sixties his idea of continental drift was ignored by some, panned by others. When finally vindicated, it became known as "plate tectonics." Its "simplicity, elegance, and its ability to explain a wide range of observations" caused it to be cited as the geological equivalent of the Bohr atom in modern physics.

What finally convinced the doubters? Evidence from the new-born science of paleontology. Continents, it was found, had over the millennia changed positions relative to one another and to the magnetic poles. But during the intervening decades, the doctrines of disappearing land bridges and stationary continents, relics of the collapsing Earth theories, reigned.[6]

While a few Europeans had from the beginning supported drift theory (remember, they were attuned to the idea of a dynamic Earth), Americans cried "unscientific," calling Wegener "an amateur." "He has taken liberties with our globe," said one. "If we are to believe Wegener's hypothesis, we must forget everything which has been learned in the last 70 years and start all over again," said another. "Besides," said others, "What kind of machinery can move a continent through a sea of rigid basalt?"

Historians have proposed a number of reasons why this scientific diversion may have taken place. The earth sciences were young in America, its geology poorly known. Therefore, as Dana's permanence theory came along, Americans may have been unwilling to see its flaws, it being one of their few theoretical contributions to 19th-century geology. Moreover, much of the supporting evidence for the displacement of continents came from areas Americans had not explored—from South Africa, South America, and India. For example, fossils of *mesosaurus*, a small reptile that lived around 270 million years ago, are found only in Brazil and South Africa.

In the words of one geologist who lived through the times: "It's strange to look back on all of this and recognize myself as an impossibly myopic, pseu-

[5]This is a variation of the Archimedes principle, and it is known as *isostasy*.

[6]"Floating logs" and "rafted grasses" were also popular proposals.

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doscientific clown."

A Tale of Two Magnetons

February 13, 1911. The existence of the experimental *magneton* is announced by the Alsacian Pierre Weiss in a brief note in *Comptes Rendus*, a journal of the French Academy of Sciences. The magneton was said by Weiss to work like a tiny bar magnet. An integral part of all atoms, it was "a new universal constant." When forced to explain a bit more, Weiss said that, in analogy, it could be thought of "as a transposition of the idea of the electron into the magnetic realm."[7]

Now, Weiss' magneton was not just a number, but was to be physically real, just like electric charge is real. In today's language of physics, the magnetic analogue of charge is known as a particle's *magnetic moment*. Weiss was led to his revolutionary idea by his measurements of the magnetic properties of metallic molecules, which vary, for example, when temperatures change. The measurements suggested a fundamental unit of magnetism: each molecule would have the option of being without a magnetic moment or would possess one equal to an integral number of magnetons. It took some 30 years and a number of other diversions to dispel this idea.

In 1911 scientists were deeply concerned about understanding what Weiss called "that world of marvelous beauty and inimitable precision that is the interior of the atom." Niels Bohr had just begun working on his model of the atom, building on that of Rutherford, who had suggested that the electrons circle around a tiny but massive positively charged nucleus. But the new Bohr model, as A.S. Allen observed, "raised as many difficulties as it removed." Invoking a spinning electron helped remove some discrepancies, but it soon became clear that some form of magnetic electron was needed as well. What was the natural unit for magnetic moments? Was this to be the Weiss magneton?

Bohr was at first interested, writing, "I am at the moment very enthusiastic about the quantum theory, but I am still not sure this is not due to my ignorance. I can say the same, in a far higher degree, about my relation to the theory of magnetons. I very much look forward to trying to get all these things straight next term." Quantum theory he continued to support, but his interest in the Weiss magneton soon flagged. It did not seem to fit into his philosophy. He therefore developed his own "magneton," a pure number, formed simply by combining three fundamental constants into a quantity which had the units of magnetic moment.[8]

In 1916, it was found that when two ions in the iron group had numbers of electrons differing by one unit, their

[7]It sounds almost like Weiss was predicting the magnetic monopole, but that was a concept which came somewhat later. Magnetic monopoles themselves are still speculative, hypothetical particles.

[8]The Bohr model, as it was able to explain the spectrum of hydrogen, was immediately embraced by almost all.

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magnetic moments differed by five Weiss magnetons. This is one Bohr magneton. So, Bohr's quantity became accepted as a property associated with an electron. But it didn't deny the existence of that which Weiss had experimentally determined. The two magnetons coexisted more or less peacefully for another 14 years.

Before proceeding further, let us emphasize that Weiss was a respectable scientist who described himself as working in minerology and the "physique des solides." (This was at a time when the idea of solid-state physics as a discipline had not yet surfaced.) In the process of building his world view of magnetism, Weiss described what we now call "magnetic domains," and his name remains in the literature for this invention. As an expert in ferromagnetism he was able, using an earlier theory, to describe a ferromagnetic material correctly: "There is no essential difference between a magnetized body and a body which is highly magnetizable. . . . But in the one, magnetization is coherent, whereas in the other, it is confused." In so doing, he invoked "a field" within the metal, produced by the collective influence of all the molecules.

Trying to understand "not the effects, but the sources of this field," says Pierre Quedec, "started him down the path toward the magneton." At the time, no one knew much about magnetic substances, and so Alfred Ewing had constructed a simple mechanical model of a substance "packed with tiny magnetized needles." When he put it in a solenoid, he in fact could even reproduce certain features of magnetization curves.

To come to the magneton, Weiss needed another idea, and for that he turned to some work by Walther Ritz. Ritz had tried to account for the laws governing atomic spectra by devising his own atomic model and, in so doing, he proposed the existence of magnetic fields within atoms. These fields, he said, were created by linear magnets, each constructed as a chain of tiny rods of equal length, magnetized or neutral. The length of the elementary rod was assumed to be constant.

The question to be resolved was whether the magnetic moments of two different magnetic metals existed in an integral ratio to one another. If so, one could justly conclude that the Weiss magneton did indeed exist. In 1909, Weiss worked with Kamerlingh Onnes on a series of low-temperature experiments to try and resolve this question. The two concluded that no simple ratio existed between the moments of iron and nickel. But the conclusion was followed by an ambiguous statement: "Of course, if proof of the primordial significance of this quantity escapes us in this case, nothing would authorize the converse conclusion either."

In 1911, Weiss, working alone, cried "Eureka!", having reanalyzed the 1909 data. The magnetic moments of a gram-atom of nickel and of iron were, he said, in a ratio of 3 to 11. Congratulated on the birth of the magneton, Weiss pointed out that if one supposed those little rods of Ritz to be magnetons, he could line them up and then there would be "100

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of them end to end inside one atom."

Weiss permitted himself to crow a bit at this point. "As the electron has symbolized the new ideas on the discontinuous structure of electricity, so the magneton marks an analgous evolution in our representation of magnetic phenomena." This is no doubt why, in writing of this episode in the history of science, Quedec called his article "Weiss' magneton: The sin of pride or a venial mistake?"

At the first Solvay conference in 1911, a colleague of Weiss talked of the magneton, linking it to the newly proposed "quantum of action." The search for experimental evidence was on. Eventually its presence was detected in 20 ions within some 65 different compounds. Around 1930, the first woman came on the scene: Alice Serres, a worker in Weiss' Strasbourg laboratory. In studying magnesium ferrite, she produced an experimental curve which could, it was said, be transformed into three straight line segments, presumably representing magnetons.

Meantime, the new quantum mechanics was being born. Using quantum theory, the magnetic moments of ferric ions were predicted. Measurements of them in the mid-thirties confirmed the predictions of quantum theory. They were not multiples of magnetons, but were *fractional*, that is, half-integer. Scientists now turned against Weiss' magneton, but he continued to labor in its behalf, as did at least one of his colleagues. Weiss died in 1940, unvindicated.

How could the experimental magneton have survived those 30 years? First, although there was no adequate theory of ferromagnetism at that time, the Weiss magneton fit into no theoretical framework at all. When the latter objection was raised, Weiss replied, "One should not question a phenomenon merely because one has no understanding of it." In contrast, the Bohr model had a place, indeed a need, for his magneton.

Also, there has been some talk that Weiss "trimmed his data," that is, selected out only confirmatory reports. Perhaps. But it must be emphasized that others, too, found evidence for the magneton and that he seemed a cautious and honest experimentalist. As the N-ray affair, which is next on our list, was proceeding, he cautioned critics to "adjourn the trial, the activity still being underway."

Rays of Suggestion

"The electromagnetic spectrum has been completed." "Original." "Exemplary measurements." "A possible explanation for the hyperacuity of hysterics."

These are just a few of the comments that greeted the 1903 announcement of the discovery of a new kind of radiation by the French physicist, René Blondlot. To honor his birthplace of Nancy and his university there, he called these new rays N-rays. It took but three years for his rays to be dismissed as figments of the mind, both his and those of some 40 others.

Just as Fleischmann and Pons are respected chemists, Blondlot was a re-

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spected physicist. In 1903 he was one of the eight physicists named a corresponding member of the French Academy of Science. There is, moreover, no evidence that he was "cooking his evidence" and providing the world with a hoax like that of the Piltdown man. Considering the times, a new kind of radiation was well within the realm of believability. "Radiations old and new, demonstrated and refuted, interpreted and reinterpreted abounded: cathode rays; Becquerel rays, including alpha, beta and gamma rays; black light and now N-rays," as Mary Jo Nye wrote in setting the stage.

The question Blondlot set out to answer was a crucial one at the turn of the century: It involved the nature of the X-rays first generated in 1859.[9] Were these X-rays particles *or* waves? Today, we believe in the duality of electromagnetic radiation, that it is both particle and wave. In Blondlot's time, however, such a suggestion would no doubt have been regarded as heresy.

What *was* known at the time? A particle could be deflected—bent out of its original trajectory—by passing it between two metal plates, one with a negative charge and one with a positive charge. In contrast, an electromagnetic wave could not be deflected by charged plates. But it *could* be polarized, i.e., encouraged to oscillate only in a certain plane. Therefore, said Blondlot, if X-rays are waves, they must be polarizable.

His detector was a simple one, consisting of a "spark-gap"—a pair of pointed wires with an electric spark jumping between them. The idea was that if X-rays were polarized, the electric part of the electromagnetic wave would *visibly* brighten the spark. And indeed Blondlot saw that when the spark-gap detector was placed in a certain orientation with respect to a tube discharging X-rays, the spark lit up.

Visual detection of changing luminosity was not only central to French optics at the time, but it was something with which Blondlot was comfortable. It was, however, far less sophisticated than the methods employed by physicists elsewhere in the world. And here, in retrospect, lay the first experimental error.

Meantime, Blondlot discovered that a quartz prism could bend the incoming radiation. This was definitely a "no-no," as previous experiments had shown that X-rays can *not* be bent by running them through a prism. It is at this point that Blondlot made what Irving M. Klotz once called "a disastrous conceptual leap." The spark brightened. Therefore, some wave was hitting the detector. If it wasn't an X-ray, it had to be a new kind of radiation. Ergo, N-rays.

To establish that ordinary light waves from the source were not responsible for the observed change in brightness, Blondlot refined his apparatus. Believing that cardboard was transparent to N-rays, he covered the spark-gap detector

[9]In fact, the discovery of X-rays was the first scientific discovery to have captured the imagination of the press. There were even jokes and cartoons; a man posing for his portrait received, instead, a picture of his skeleton.

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with a cardboard box, placing a photographic plate at the bottom. Between the detector and the photographic plate was a ground-glass screen. Its purpose was to diffuse the light from the spark, making a fuzzy spot on the plate. The N-rays, he said, would pass through the box, brightening the spark and darkening the spot on the photographic plate.

He next demonstrated (he thought) that excluding light did not diminish the effect of N-rays on the spark. He then went on to develop ever more sensitive devices for detecting his newly found rays. Besides X-ray tubes, Blondlot found many other sources of N-rays. To name but a few: the Sun, a flame, a piece of sheet iron or metal heated to dull redness, even the lowly electric lamp. Moreover, he found that certain materials, once exposed to N-rays, could store and later reemit them. Sheets of feldspar, for example.

Adding frosting to the cake was a colleague at the University of Nancy. Augustin Charpentier, a professor of biophysics, published in May of 1904 seven papers (!) supporting the idea. Rabbits and frogs gave off N-rays, he said. Ditto, the nervous system.[10] Moreover, concluded Charpentier, N-rays augmented a man's ability to see, smell, taste and hear. Then came the suggestion that N-rays were emitted from enzymes isolated from body tissues.

In just three years, some 300 articles on the topic were published, a remarkable feat in the days before the fax, electronic mail, and word processors. Blondlot did his share, putting out a book and 26 articles. It is said that to describe briefly the many claims made required 59 pages.[11] Criticism, nonetheless, was not long in coming, centering at first on the subjective nature of the detections. Blondlot countered that the ability to detect the N-rays varied from person to person. The observer, he said, "should play an exclusively passive role, under pain of seeing nothing." According to written instructions, the observer was to be silent, refrain from smoking, avoid straining his vision, look slightly away from the source, etc.

Obviously someone had to check the matter out, and part of the task fell to R.W. Wood, a professor of physics at Johns Hopkins University. He was both an internationally known expert in optics and a man who loved nothing better than a good prank. Wood arrived in Nancy in September of 1904. Blondlot showed Wood a number of his experiments, beginning with that which had originally convinced him of the existence of N-rays. Finally, he came to the point when he attempted to demonstrate that there existed N-rays of at least four different wavelengths. The rays were presumably bent and spread out into a spectrum by passing them through an aluminum prism in a darkened room. A phosphorescent strip which could be moved down the middle of the detector presumably allowed one to identify changes in brightness, from dim to

[10]Hence the claim that they might help explain hysteria.

[11]In contrast, in the first two months of cold fusion, just one laboratory circulated some three inches of paper dealing with the various claims and counter-claims.

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bright and back again. Wood could detect no change: "I asked him to repeat his measurements and reached over in the dark and lifted the aluminum prism from the spectroscope," he later wrote in a letter to *Nature*. Suffice it to say that when the demonstration was repeated, the results—*sans prism*—were the same. Even though Wood did not mention Blondlot by name, when his observations appeared in *Nature*, it went a long way towards sealing the death of N-rays.

Meanwhile, the French journal *Revue Scientifique* had challenged Blondlot to a definitive test as she had not yet involved himself in a cooperative venture. Two small sealed wooden boxes were to be submitted to Blondlot, one containing a piece of tempered steel—an alleged source of N-rays—and the other a piece of lead. Blondlot, using whatever kind of detector he preferred, was to distinguish between the two boxes. Blondlot's reply was a while in coming. In 1906, he wrote: "Permit me to decline totally your proposition to cooperate in this simplistic experiment; the phenomena are much too delicate for that. Let each one form his personal opinion about N-rays, either from his own experiments or from those of others in whom he has confidence."

To this one scientist replied: "If N-rays can only be observed by privileged rarities, then they no longer belong to the domain of experimentation."

A number of things propelled this scientific diversion. New radiations were in the air. There was renewed interest in psychiatry and spiritualism. A number of the French were worried that scientifically the country had fallen behind the times; they were therefore seeking desperately "to catch up." Then, at bottom, a kind of mass hysteria took over. But it was not, as some have alleged, just "a French effect." N-rays were also detected in London and at the Royal University of Ireland.

A Wonder Water

In 1963, as many of you will recall, Kurt Vonnegut released a chilling tale, *Cat's Cradle*, in which a scientist discovers the existence of *ice nine*. It is not the atomic bomb which signals the apocalypse but a seed crystal capable of transforming ordinary water into dense ice. Fiction seems to have predicted fact. As the bandwagon began to roll for "a wonder water" from Moscow, a warning appeared in *Science:* "Experimentation with the new superdense water ought to be disallowed as this might affect the oceans, turning them solid." As the press put it: "New form of water threatens all life on Earth."[12]

The Soviets seem to have had a long-standing love affair with water and its anomalies.[13] It was perhaps therefore no greater surprise to hear one of the discoverers of this marvelous water, Boris V. Derjagin, declare that the time had come "to reconsider the universal rec-

[12]The unlikelihood of such a disaster was quickly pointed out in 1969.

[13]Just one more example: Twin brothers from Kazakhstan once claimed discovery of another form of water said to have a greater biological activity than ordinary tap water.

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ognition that has been accorded to the constancy of the properties of liquids." He was referring to the 1962 finding of what he and his colleagues called "a truly astonishing discovery"—a new, stable form of water with a density almost one and a half times that of the ordinary sort. They called this *Water II*. Ordinary water, the stuff of life, was *Water I*.

Because its structure was apparently polymeric, it soon came to be known as *polywater*. This stuff, a Vaseline-like substance, was described as having a freezing point of −40°C and a boiling point higher than 400°. The idea of a superdense form of water did not generate much interest in the States until Derjagin gave a talk here in 1966. Even then it still took a while for the idea to take off.

In the late sixties, however, the existence of polywater was "confirmed" in laboratories here and in Britain and Belgium. "A brilliant future in industry" was predicted for the new and stable polymer. A Russian astrophysicist suggested that certain (noctilucent) clouds consist of polywater drops which, in contrast to ordinary drops of water, may remain high above us without being evaporated and/or crystallizing. An American astrophysicist, not to be outdone, suggested Venus as the site of polywater. It was suggested that because of its greater density, polywater might exist at the ocean's bottom.

The first two of a batch of confirmatory reports here in the states both involved Ellis R. Lippincott and two well-respected institutions, the University of Maryland and the National Bureau of Standards. Lippincott, according to reports circulated at the time, was well known for his work in spectroscopy and his spectroscopic equipment. Moreover, the claim made was that the groups had created larger amounts of anomalous water than previous investigators, perhaps as a result of the NBS being involved. Not only was "overwhelming" evidence for polywater proclaimed, but even a rather curious observation of Derjagin was confirmed—that the anomalous water had the ability to creep up the walls of the capillary containing it.

Let's have a closer look at details. The evidence involved spectroscopic studies of anomalous water both inside and outside of the capillaries in which it was formed. The polywater was prepared by the condensation of water vapor in quartz tubes. These capillary tubes were suspended over distilled water in an evacuated and sealed system. *Voila!* Eighteen hours later you have polywater. The idea was that ordinary water was "restructured" into polywater by means of some sort of catalytic effect.

In these early studies enough features proved to be different from those of normal water so that the conclusion *had* to be "the presence of some new form of water." Moreover, the experimenters claimed that the anomalous water "contained no impurities beyond silicon in trace quantities" and some sodium at a level of "less than 0.5%." This was presumably circulated to counter the talk that it was just contaminants that

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gave the water its unusual properties.

The existence of polywater indicated that a type of revolutionary molecular bonding had to exist, something that had not been seen before in any substance containing only oxygen and hydrogen. Lippincott and his colleagues therefore proposed two hypothetical structures for this new water. Both were based on Lippincott's belief that extra stability was given by a structure with oxygen atoms at the corners of a planar hexagon. The first structure therefore was a network of hexagonal units; the second a highly branched polymer chain.

The case for polywater was by now looking pretty solid. However, there were doubters. Some initial reactions of doubt were characterized by the *New Scientist* as dismissable "because of the rather unscientific—but entirely human—desire *not* to believe that there could exist a form of our most ubiquitous liquid that no one had found before." Derjagin himself had addressed the question of why, if polywater existed, it had not been found earlier either in nature or in the laboratory. One could argue for its relatively late appearance in the laboratory because, as the Soviet Academician said, "the technique for obtaining it is based mainly on the perseverance of the experimenter, not on a complicated modern apparatus." One could as well think it ought to have been seen in nature, Derjagin pointed out, "especially since, during investigations of the isotopic composition of natural water, its density is measured with great accuracy."

He replied to the straw question he had set up with this statement: "It might very well have been discovered much earlier if there had not been a tendency to ignore it because it did not fit into the generally accepted scheme of views. . . . And, if it were not for the strong, unverified prejudice that everything could be explained by impurities."

Later, Derjagin had to eat these words. In 1973 he released extensive results, showing that the anomalous properties could indeed only be obtained in the presence of a high concentration of dissolved minerals. It was the enhanced dissolving power of condensing vapors which led to these concentrations. The stuff called *polywater* was just ordinary water with impurities!

As a diversion, this case is interesting for a number of reasons. It is unlike the others in that the *same* scientist who helped to create the controversy *also* played a large role in debunking it. This says a good deal about the scientific integrity of that scientist. Likewise for the premise he started from—that, while there is "an unwritten tradition among physical chemists to regard the properties of liquids as essentially invariant," there is no proof that this is the case. Indeed, it takes only one case to upset tradition, for science, like the dictionary, is continually being rewritten.

The polywater affairs bears an uncanny resemblance to the "more modern" cold fusion story for, as *Science* reported, "The lively controversy was fueled by everyone's inability to produce more than microliters of the substance."

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Sins of Science

"The history of science is not restricted to the enumeration of successful investigations," said James Clerk Maxwell long ago. "It has to tell of unsuccessful inquiries and to explain why some of the ablest men have failed to find the key to knowledge. . . ." Some of the common sins of science, from flawed assumptions to egos, are indicated here in these five tales.

Flawed assumptions. The notion, for example, that the answers to scientific questions are simple, either black or white. Take the case of N-rays: If it's not X-rays, it must be a new form of radiation. Water II: If it's not ordinary drinking water, it has to be a new and anomalous form of water. Cold Fusion: If it isn't a chemical effect, it must be a new and exotic form of nuclear physics. To date, trying to sort out cold fusion claims has involved not only nuclear physicists and analytical chemists, but scientists involved in electrochemistry, materials research, condensed matter physics, the physics of fusion reactions, calorimetry, and neutron and gamma-ray spectroscopy.

Pride. N-rays are sometimes called "the Nancy effect" as most were seen there. They were viewed as vindicating the idea of decentralized science in France and indeed all of French science, perceived by many at the time to be "flagging." The reason was pride. Weiss with *his* magneton succumbed to a form of this. The Americans touted the idea of permanent continents in part as it was *their* contribution to 19th-century geology.

Wegener labored fruitlessly till the end of his days in search of evidence to confirm his drift theory; Weiss sought a theoretical home for his magneton. No doubt, as administrators at the University of Utah issued press release after press release, pride and the desire to pull the University up by its bootstraps were at work. But so, too, was *fear*. Said one Utah businessman of cold fusion: "If this fails, we'll have egg on our faces. It'll show the world that Utah is unaware of the proper scientific process."

The ostrich effect, or self-imposed secrecy. Blondlot refused control experiments apparently on the grounds that the eyes of others "were not sensitive enough" to evaluate N-rays. Described as "irrational, even perverse," he never agreed to any cooperative venture nor did he include exact details of his apparatus and investigations in his papers. Neither have Pons and Fleischmann. Cooperative ventures were eschewed; details came not from their papers, but from the fax machine.[14]

Trying to duplicate what Pons and Fleischmann said they had done, quipped one experimentalist, "was like trying to produce veal cordon bleu without a recipe." Ironically, a 1927 application for a Swedish patent to produce helium from hydrogen was rejected for just this lack of detail: "The description is not complete enough that by its use an expert is likely to be able to practise the invention."

[14]One wonders how Bohr would have viewed "fax physics," frustrated as he was by having to wait for the English translation of his electron theory of metals, watching articles appear written by authors unaware of his results.

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The democratization of science. In the hullabaloo that accompanied the announcement of cold fusion, it was called "a revolution in the way science is done." That is, by poll and press.[15] Recall the poll at the APS meeting in Baltimore. Wegener, too, played this game: He polled scientists as to the possibility of land bridges throughout time. He translated the results into a graph which he used in his 1966 book, *The Origin of Continents and Oceans.* In addition to his scientific opinion poll, he reported testimonials, quotations from geologists whose field work supported his theory. A form of this, always claimed "as a last resort," is to call a reporter. It is not new. In 1960, Theodore Maiman announced the first laser after having had his paper rejected by *Physical Review Letters.* In 1987 Paul Chu announced a new high-temperature superconducting material *sans* journal article, but at least with confirmatory experimental evidence.

Publicity seeking. It involves overselling on utilitarian grounds. N-rays were to explain hyperacuity; polywater was to have untold commercial applications, but the greatest of these—cold fusion—was to be a cornucopia effortlessly spewing out unlimited energy. Another form of publicity seeking is the premature announcement, which has often been used. In recent years, it has twice involved the University of Utah. *Newsweek* was the first to report the 1972 "discovery" of X-ray laser action in certain materials. (It was never confirmed.) The cold fusion press conference was said by the University of Utah to have been necessary because "a reporter was about to break the story and the university felt an obligation to make sure it was released accurately." The alleged reporter, however, was never heard from.

To his credit, in May, the Dean of Science at the University of Utah was quoted as saying that if they could turn the clock back, "we would have had, at the minimum, a scientific seminar first." Contrast this with Charles Darwin who, after discovering the theory of natural selection in the fall of 1838, recounted later in his autobiography that he "was so anxious to avoid prejudice that I determined not for some time to write even the briefest sketch of it."

Greed. At least in the case of cold fusion, this involved the public as well as scientists. Everyone was excited at the thought of getting "something for nothing," unlimited energy pouring out of a juice jar. "If this discovery pans out, the University of Utah will be the richest university in the country in five years," said one report.

Fame. Translated to these days, fame for a physical scientist means a Nobel prize. Unfortunate as it is, these prizes are often awarded to those who make the first (or perhaps loudest) announcement, even though the work later turns out to be flawed. Take the case of Wendell M. Stanley's crystallization of the tobacco mosaic virus; his work was flawed by technical errors and miscon-

[15]In the early summer, one national laboratory scientist "published" preliminary results in Salt Lake City's *Deseret News.*

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ceptions, his virus sample, as was pointed out in the late 1930s, contained water and impurities. Nonetheless he received the 1946 Nobel Prize.

Indeed, while four of these tales have ended, that of cold fusion still must be played out to its end. While a commercially important form of desk-top fusion is implausible, it is unclear whether or not "this twig" will someday form an essential part of a bigger, more satisfying theory. We can only wait. ■

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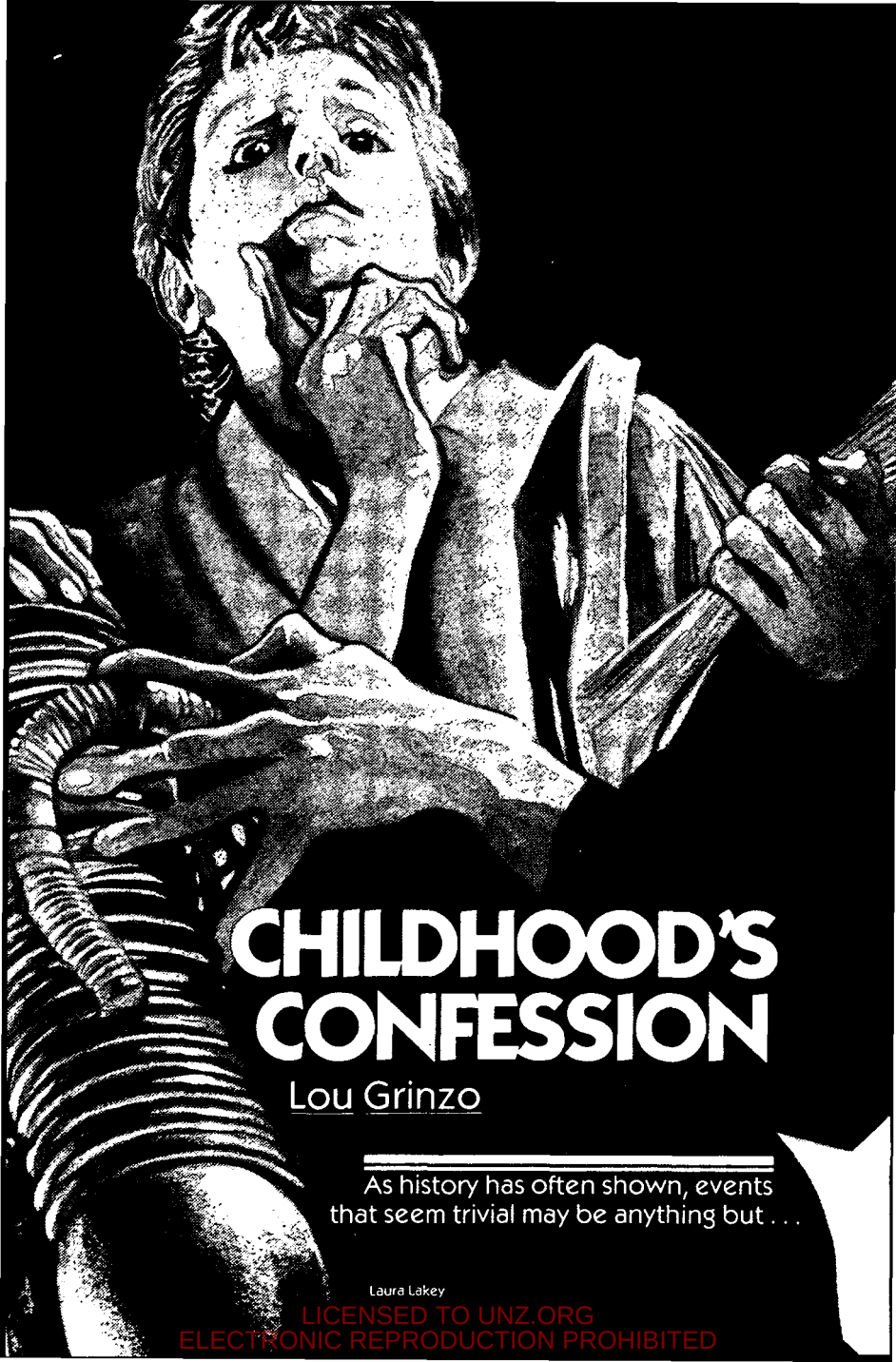

CHILDHOOD'S CONFESSION

Lou Grinzo

As history has often shown, events that seem trivial may be anything but . . .

Laura Lakey

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My name is Hank Innes, and I'm writing this to correct the public's view of the Visitor Fight. It's been over forty years since it happened, and, except for the official version, there's hardly been a single word printed or publicly said about it since Richard Polanski's trial. Because of this, everyone still thinks of Polanski as the lowlife he was portrayed to be. This is inaccurate and unfair, and it should be corrected.

To date, no one has been able to tell what really happened the day of the fight, the day the Visitors left Earth in disgust and headed back to their planet, wherever that is. None of us who were involved wanted to challenge the government and try to get our account of it published, even anonymously. That's why you'll be reading this such a long time after the Visitor Fight, after I'm dead, when even the government can't do anything to me.

Where to begin? The popular view of what happened that day is full of the reckless nature of Richard Polanski and the innocent behavior of ten-year-old boys. Both parts are just plain wrong. Polanski, God rest his soul, was a decorated Army officer with an outstanding service record, and he was a well-respected member of the secret service. But he made a bad decision under the kind of pressure that would destroy most people.

As for the childrens' part in what happened, I know better than anyone why the fight really happened. You see, it was my fault.

A peculiar aspect of that day's events is that they're frozen for all the generations to come in a single black and white newspaper photograph. Sure, there are the tapes of the trial and the interviews and the live TV reports from the site, but the event collapses into that one photograph, showing a group of small boys standing around a body on the ground. It's funny how that happens, how a shutter tripped by a photographer's instinct creates an image that instantly becomes *the* photograph that tells the story, as if all of mankind had conferred and agreed on the matter. It happens all the time, of course, but that doesn't make it any more understandable. The Kent State shooting. The Challenger disaster. Tearing down the Berlin Wall. Lee Harvey Oswald's murder. The Visitor Fight. Each historic moment, compressed into a single negative.

It's important that you understand what it was like, being in the fourth grade and having an honest-to-God *alien* in your class. You've seen the pictures of the Visitors. How they didn't wind up being tagged with some smart-ass name straight out of a bad science fiction movie, I'll never know. The point is, from the day "Bob" showed up at school, life ceased to be normal. One day a group of men in suits walked into our classroom—right in the middle of a history lesson, I can still remember it that clearly, we were learning about Shay's Rebellion—and the look on our teacher's face instantly told us something unusual was happening. One of the men was the president of the United States. Most of the rest were probably secret service agents, although I didn't know that at the time. There was a White House photographer and a single

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TV news team there to record the exact moment when an alien child entered a human classroom. The class was dead silent as we tried to understand what was going on. Keep in mind that the public had only seen the Visitors on TV up until that point, and even then it was mostly staged photo opportunities with world leaders. The alien kid and one of his parents came shuffling in. He was taller than all the kids in the room, dressed in one of those silky blue robes they wore, all horrid-looking and wheezing, with too many arms, and breathing some sort of gas mixture through a respirator connected to a lunch-box sized contraption he carried. The class erupted. It should have been clear to the adults involved that this was a bad idea and they should have found a diplomatic way to call it off right then and there. But they didn't, of course.

Once everything calmed down, the president made his famous "Children of the Universe" speech, which I'm sure you've heard a thousand times, and explained how this Visitor child would attend our school as a sign of mutual trust. Our teacher, a frail little woman with huge liquid brown eyes, looked like she was going to have a breakdown. Even then, I remembered feeling sorry for her.

From that day on, a significant part of our lives was spent avoiding reporters. But the kids got the worst of it. Every recess, every school function, even the slightest sign that something the least bit out of the ordinary was going on at the school was cause for us to be swarmed by reporters carrying cameras and bright lights and microphones up and down the halls. It took a while before the media and our parents came to an agreement, but there were still intrusions and occasional parental lectures.

We weren't even aware of what the Visitors were doing here. All those meetings that they had at the United Nations, all the hints at wondrous things that could come out of a friendship between our races, none of it was explained to us at the time. The adults were scared stiff that we would do something inconvenient and screw it all up. No one even tried to make us see things from Bob's point of view. He was probably scared out of his mind. Maybe the way they treated us contributed in some small way to what happened.

Bob didn't seem to be bothered by any of it, although it was hard to tell. I guess the pressure on him was even worse than it was for the rest of us, considering how difficult it was for him to communicate with us. Any race that would put one of their children into a position like that would probably have lectured the kid to death on how important it was that he behave himself. But who knows, if this race was that concerned with such things, maybe it's part of their nature, and they wouldn't *have* to stress it.

But I feel like I'm avoiding the issue here.

Thomas Alva Edison grade school, in Union City, New Jersey, is your average inner-city public school. There are lots of fights, and almost every group of boys knows of at least one fight that will take place after school on any given day. But on the day it happened, there were no arranged fights, at least none

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that were exciting enough for the gang I hung out with. So one of us came up with the idea of getting the class bully, Karl, into a fight with Bob. I was the one; it was my idea.

I won't try to justify what happened with some sort of flippant "boys will be boys" attitude. None of us saw the ramifications of what we were doing. We'd been lectured almost non-stop since Bob came to our school about how important it was that we got along, that we "set an example" for humans and Visitors. God, how I learned to hate that phrase, "set an example." No one let us forget for a minute the strange microscope we were all under. The point of all this is simply that, yes, we were little boys, but we knew better.

It was so easy to start, too. A couple of us simply dared Karl to fight Bob. That, plus a little encouragement, was all it took, since Karl lived for chances to be a tough guy. Several others talked to Bob and somehow convinced him that he had to defend his honor or some such nonsense, not that I think he fully understood what was happening. We were just pleased with having arranged something exciting. Now, I can see how ridiculous and foolish it all was, but at the moment, I was thrilled to have started it.

When school let out that day, about fifteen of us followed Karl and Bob down the block and into the empty lot behind our favorite candy store. There was the usual little boy bravado about it all—everyone was talking tough and taking sides and savoring the delicious anticipation of it, especially *this* fight. Karl dramatically dropped his books and took off his dark blue windbreaker and threw it down. A bunch of us started pushing and moving around for a good view. Bob just stood there, with his skinny, ropey arms at his side, obviously unaware of what was expected. Karl walked up to him and pushed him hard on one shoulder, and that's when things got crazy. Cars squealed to a stop in the street; doors opened and men in dark suits came piling out too fast for anyone to react. They all had guns. One man in particular—Richard Polanski—walked toward Karl and Bob, pointing at them with one hand—the one without the gun—and said, "OK, boys, let's break it up. We don't want to have a fight here." Those were his exact words. I'll never forget them or the pleading, almost hysterical tone in his voice. It was as if he knew with absolute certainty what was going to happen, and he wanted desperately to stop the future from coming true. Karl got this defiant look on his face, that same look he'd get every time he was about to do something to piss off a teacher. He turned away, as if to comply with Polanski's request, then turned back around and punched Bob in the face. The alien teetered for a second, then hit the ground flat on his back.

And Polanski shot Karl. A single clean shot in the chest that threw him to the ground, dead. One of the other men started screaming, "What the fuck did you do that for? Where the hell are your brains? Give me your gun, Polanski!"

Some of us started crying, some of us just stood and stared at Karl on the ground, and a couple of us turned and ran home. I was convinced that these men with guns, secret service agents,

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I found out later, knew about my part in the fight and were going to shoot me as punishment. I kept looking breathlessly at each one in turn, trying to spot the one who would do it, waiting for one of them to raise his gun.

Reporters and the local police were there in minutes, and that's when the famous picture was taken. I'm the second kid from the left in the crowd, the terrified one wearing the white polo shirt and dark pants.

The archived news reports say that somehow all of the Visitors knew at that moment what had happened, and they turned to whomever they were with and demanded to be brought together, and to see Bob. As soon as the delegation was assembled and they determined that Bob was not seriously hurt, they had a brief meeting and gave the highest ranking person available, Secretary of State Frankel, their famous message: We refuse to associate with barbarians.

Within days of the shooting, Richard Polanski was the victim of the biggest smear campaign in the history of mankind. He was a decent man who made a mistake, but everyone ganged up on him—the media, the government, old friends. He was branded a maverick, an alcoholic, a pervert—everything they could hang on him to "prove" to the Visitors that Polanski wasn't a fair example of what mankind was really like. No one had the guts to stand up and say, "Wait a minute—Dick was a good man who screwed up. Let's have a little compassion here." We were pleading to the sky, screaming for the Visitors to come back, and Richard Polanski was sacrificed in the process.

For a case with that kind of pre-trial publicity, it should have taken weeks, or even months to pick a jury. But they did it in a single day. It took an emergency session of the New Jersey state legislature to legalize capital punishment, but they did that in record time, too.

The trial itself was a farce, as one liar after another was paraded through the witness stand, one piece of falsified evidence after another was presented, all choreographed to say exactly the right things, while Polanski's defense was a fraud. And when the two-day trial was over, they pronounced him guilty of first degree murder and sentenced him to death in the electric chair. But the worst part was the execution. My God, *they executed him on television!* The rationale was obvious. They wanted to make absolutely sure that the Visitors knew what we did. But didn't anyone in charge have the brains to see what a mistake it was? If the aliens had had any thought of coming back, that surely drove them away for good.

About twenty years after his death, I talked to Nicole Polanski, Richard's widow. She was in her late fifties by then, but she looked much older. Her hair was almost completely grey, and the lines around her granite-colored eyes showed the burden she'd lived with. It was as if her ordeal had never ended, and had continuously worn her down over the years. We took great pains to be clandestine, although I doubt we fooled anyone. If the CIA or anyone else still gave a damn, they probably knew what we were doing but figured we were harmless.

Nicole insisted that I watch recordings of the trial with her, so she could

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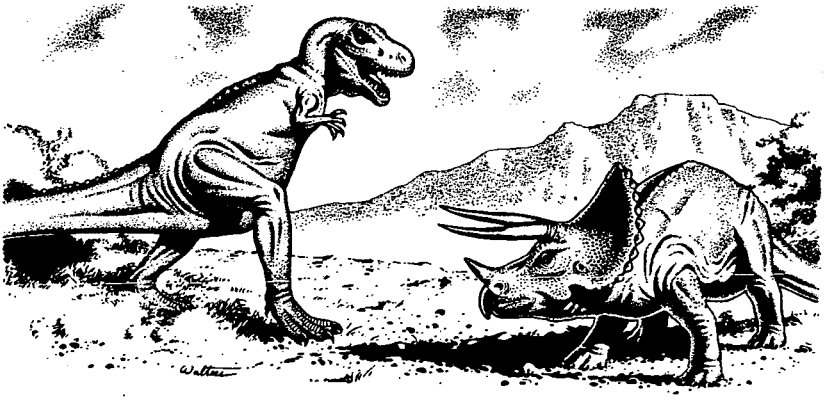
refute the lies one at a time. It was like a private trial, decades after her husband's death, as she clutched at a chance to prove to someone that her husband wasn't an ogre. The way she swiftly and confidently argued against the images on the screen, it was clear to me that she'd rehearsed this a hundred times, waiting for an audience. In all those years, no one was willing to publish her story or have a single interview with her.

If the law firm I hired does their job, and the government doesn't intervene, then this document will be sent to every major newspaper, radio and TV station in the civilized world. The fact that I got this far with my arrangements gives me hope that this account will get published. Maybe everyone's finally given up trying to lure the Visitors back, and they've realized it's time to drop the public act.

Just as my friends and I were children that day, and we didn't understand what we were doing, the entire human race unwittingly proved that it was still in its own childhood, not yet fit to associate with the adults as an equal partner.

HANK INNES

Wilkes-Barre, PA
17 November, 2041 ■



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The Alternate View

THE THREE DOLPHIN CLUB

G. Harry Stine

Two consuming and pertinent questions continue to be asked when people have the chance to query an astronaut or a manned spaceflight expert. One is straightforward, while the other is usually asked in discreet privacy. Both involve physical, bodily functions and activities.

The first question is: "How do you go to the bathroom in zero-g?"

Former astronaut Ron Evans gives a very amusing lecture about this. It's entitled, "There Ain't No Graceful Way."

The second question is asked in numerous ways but boils down to wondering whether or not it's possible to have sexual intercourse in space and, if so, if it's any better "out there" than it is "down here."

Some space advocates think that it will be much different, if not better, and are therefore anxious to get into orbit and try it for themselves.

Except for bizarre proclivities that one certainly would not expect from such macho types as American astronauts and certainly not from the semi-Victorian Soviet cosmonauts, sex in space requires two persons of opposite gender.

Or does it? Read on.

(I can't help it, and it doesn't have anything much to do with the subject, but whenever the term "sex in space" comes out, I keep recalling Jim Henson's "The Muppet Show" with the Orson Welles type announcer intoning dramatically, "Pigs in Space!")

Although the Soviets orbited the first woman (Valentina Tereshkova, Vostok 6, 16 June 1963), she was alone in her space capsule. When Svetlana Savitskaya went into orbit in August 1982, she was with two cosmonauts in *Soyuz T-7* and joined two other cosmonauts already in the Salyut 7 space station. That is the earliest that it might have been possible for this activity to have been conducted in space. But it's unlikely that it occurred. In the first place, Salyut 7 didn't have much room in it, and the cosmonauts aboard always complained that they never had any privacy. Sort of like living for months on end with someone else inside a school bus. It must be really bad in the Soviet Salyuts and Mir for cosmonauts to complain about being crowded, because the Soviet people have very little privacy of any sort, even in their apartments.

The first American woman in space was Dr. Sally Ride, who went aloft with five other astronauts on the STS-7 space shuttle mission on June 27, 1983. She was the first of eight American women to go into orbit.

Datum: All space shuttle missions have launched multi-person crews.

Datum: The Space Shuttle Orbiter has provisions for some privacy in the mid-deck living volume. Three curtained

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sleeping bunks are provided, and the airlock and toilet area can be screened off.

This column attempts to report scientific and technical news that is often overlooked or that has an alternate side to it. Therefore, in answer to the obvious question from readers: No, I do not know whether or not American astronauts have engaged in mankind's favorite recreational activity while they were in space.

However, I must report that I have heard from several reliable sources that it has indeed happened.

Not once but seven times.

(Who's keeping score?)

But let's get to the physics involved. What role does gravity play, if any? Is gravitational force really necessary? Is it possible to find out without making an expensive orbital journey? Or getting fired?

These questions have been asked regarding all human activities in the weightlessness of space. Answers have been obtainable here on Earth.

Two methods are currently used to investigate weightless activities without orbiting.

The first utilizes parabolic flight in an airplane. NASA has a specially outfitted Boeing KC-135 on bail from the United States Air Force. This is the infamous "Vomit Comet." By being flown in a parabolic flight path, the Vomit Comet can provide cabin passengers with about 40 seconds of weightlessness. (However, I seriously doubt that meaningful experimentation on the subject under discussion can be conducted in 40-second increments, numerous jokes notwithstanding.)

Another technique uses a multi-million-gallon water tank—a huge swimming pool, if you will—where people don either space suits or scuba gear, ballast themselves to achieve neutral buoyancy, and thus can stimulate quite effectively the conditions of weightless activity. Several of these large "neutral buoyancy simulators" exist in the United States.

To get some idea of how effective a neutral buoyancy simulator is, all you have to do is attempt to change the bulb in a swimming pool's underwater light. Even wearing scuba gear so it's not necessary to surface often for air, it's extremely difficult to operate even such a simple tool as a screwdriver to tighten or loosen a screw. You have to strap down or brace yourself against something to counter the reaction forces. One gains a real appreciation for both the linear and rotational modes of Newton's Third Law of Motion. . . .

In the past several years, I have received some interesting reports from reliable sources who shall remain nameless lest they possibly lose their jobs. Our national space agency is not well-known for its liberal views on the subject because astronauts are supposed to be pure as the driven snow and shining role models for American youth, as well as being unassailable by Congresscritters who usually are none of the above. These reporters tell me that several unofficial, undocumented, unreported, and quite clandestine experiments have been carried out in the Neutral Buoyancy Simulator at the George C. Marshall Space Flight Center in Huntsville, Alabama. These experiments apparently took place in the wee, small hours of

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the morning when other people, especially prudish supervisors, weren't out and about. The researchers wore scuba gear, not space suits; current space suits aren't built for two.

The results were about as expected.

Yes, it can be accomplished successfully.

But it's more difficult.

There were no reports of the subjective aspects of the research—i.e., whether or not greater enjoyment was experienced in the simulated weightless condition.

However, these pioneering researchers discovered something they hadn't anticipated. If they'd been marine biologists, they would have known of data that could have been cross-fertilized into their experiment.

The experiments showed conclusively that it helps to have a third person around to push at the right times with the proper vectors. Just like dolphins.

People who belong to groups that have unusual and unique accomplishments usually bond together to form an elite organization—the Explorers Club, for example. In aviation, the Mile-High Club is well-known among pilots. We should eventually expect to see an organization composed of people who have carried out experimentation of the same sort as qualification for the Mile-High Club, but on the final frontier. What will they call their organization? I suspect and even suggest that "The Three Dolphin Club" would be appropriate.

An appropriate symbol is also required, and I have a suggestion for that, too.

Look for the lapel pin showing three dolphins.

I sincerely hope that the Three Dolphin Club will have restricted membership for a very short period of time. I hope that within 15 years it is moribund because it doesn't matter any longer. Membership in the Three Dolphin Club will mean nothing once Earth-to-orbit transportation becomes less like a circus stunt of shooting people out of a cannon and more like buying an airline ticket and flying into space. So maybe I really don't want to encourage the formation of the Three Dolphin Club at all. . . .

I suspect this column will garner mail. In spite of the "sexual revolution" of the sixties, the main stream of Middle America remains remarkably Victorian, and current trends indicate a strong tendency to return to old moral codes. Whether or not this trend is real remains to be seen. However, sex in space is certainly going to continue being as fascinating to people as other aspects of living in weightlessness. If it hasn't happened in spite of rumors, I am certain that it will in a short time . . . in spite of NASA administrators and supervisors and the image of the Astronaut Office.

In space or on the ground we are, after all, still human beings. So of course we're going to engage in sexual activities in space! If we listen to the prudes, we're damned if we do. But if we wish to colonize the Universe, we're doomed if we don't. Take your pick. You've got freedom of choice.

Postscript

The Alternate View column, "Cap the Volcanoes!", brought lots of reader mail. It was roughly fifty-fifty between

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"I'm glad someone said it" and "You're dead wrong and ignorant of current findings!" Most of the critical letters were highly emotional. Few of them contained any scientific data or evidence to support a contrary point of view. Some readers who refuted me supplied references. In fairness to them and because I do wish to be informed if indeed I am not, I'm trying to locate and read every one of their references before replying. However, again I must point out that in the reports that I have read to date, most of the data is quite soft and most of the conclusions are based on incomplete data or even speculation grounded upon an unscientific interpretation of the incomplete data.

The Alternate View column about my trials and tribulations in finding a suitable word processing program brought a similar split in responses from readers. About half said, "I thought I was the only one having trouble with this stuff!" The other half, mostly from computer programmers, accused me of being conservative and not wanting to learn or to change my ways. In response to many of you who touted your favorite program to me, allow me to report that I tried those programs during my evaluation or I have tried them since. The cheapie program I mentioned was good for writing articles, but not for writing 100,000-word novels. The company marketing it has not replied to a long letter I sent them praising the cheapie program and suggesting the two utilities absolutely required by a professional author: word count and the ability to print a file with any starting page number. I'm currently using a word processing program designed specifically for writers. It's Wordbench(R) from Addison Wesley Publishing Company; I have written two novels and all the Alternate View columns since the column in point using Wordbench(R). It does more than my old 1979 word management program, but it's nowhere near as simple to use.

I do read every letter I get. I try to respond to those readers who considerately send along a SASE. Often because of other deadlines having to do with paying the bills, I don't have time to answer every letter with an enclosed SASE, but I try. I enjoy the feedback. Without feedback, an author or a system has a tendency to run open-loop in an uncontrolled mode. ■

Prejudice: A vagrant opinion without visible means of support.

Ambrose Bierce

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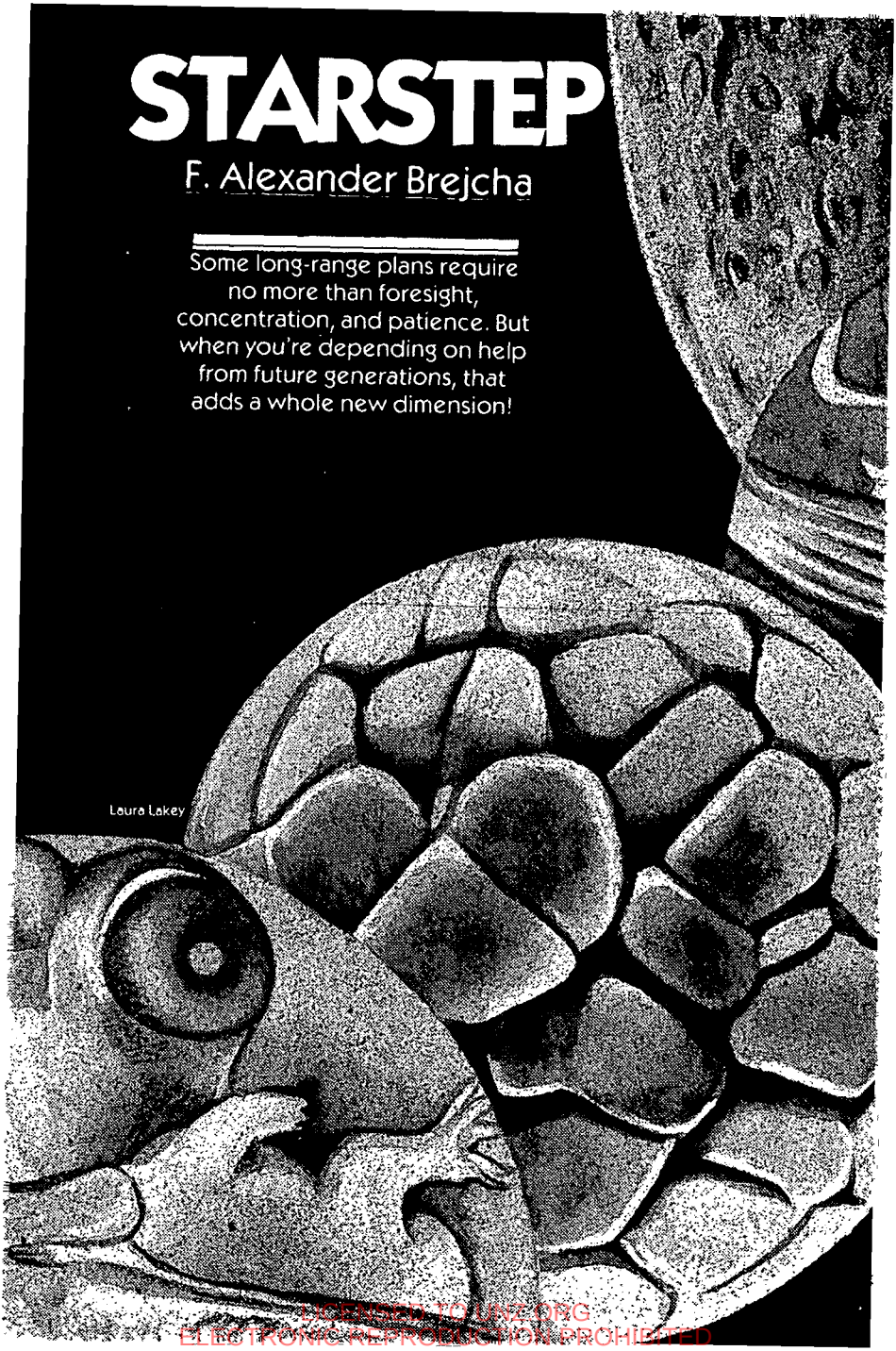
STARSTEP

F. Alexander Brejcha

Some long-range plans require no more than foresight, concentration, and patience. But when you're depending on help from future generations, that adds a whole new dimension!



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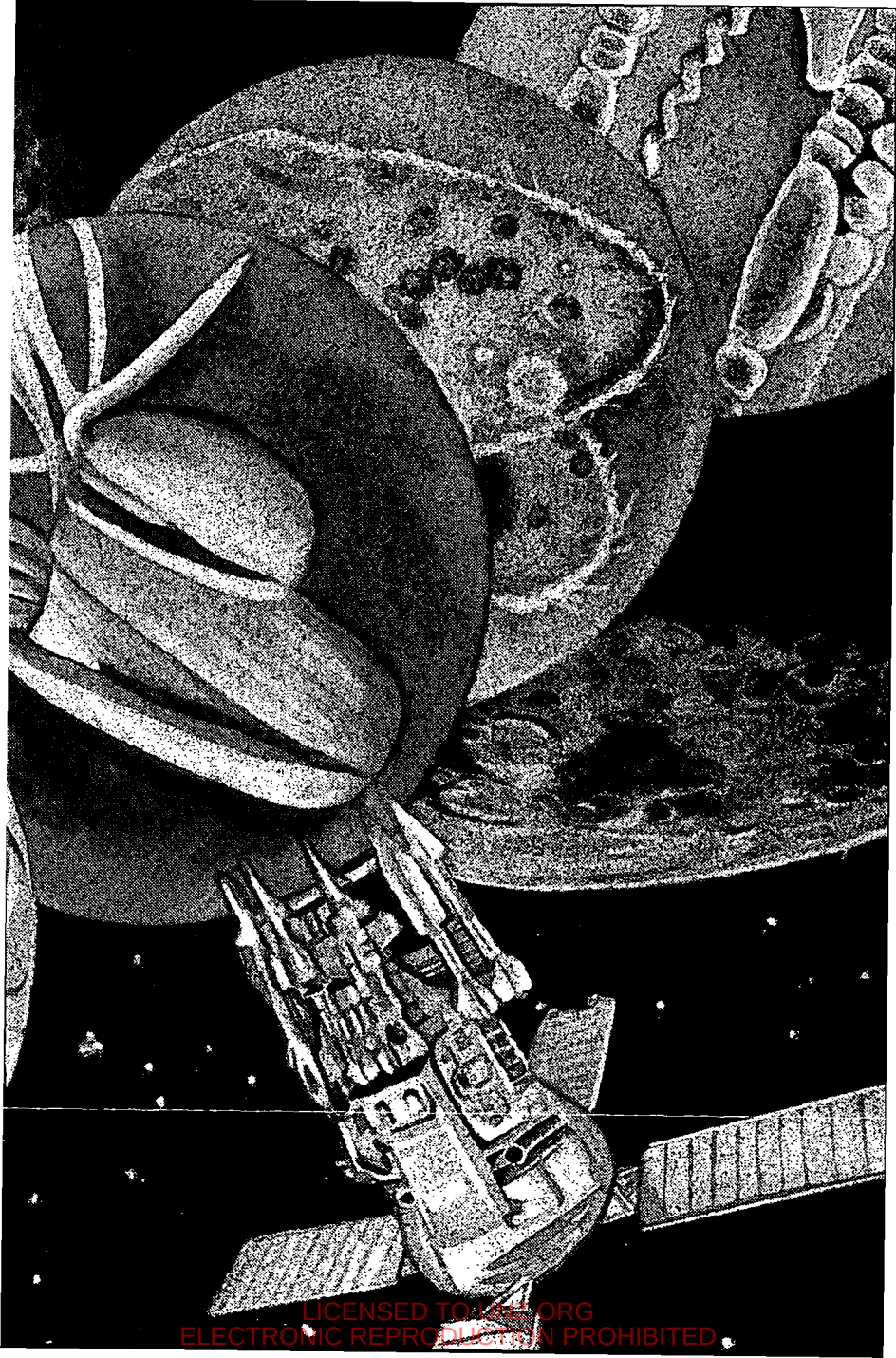

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For billions of years nothing had disturbed the small red star or its three planets. Until now. An intruder had entered the system. Awakened by concentrating radiation and increasing temperature, it jettisoned its cumbersome solar sail and divided into four discrete sections whose individual thrusters separated them and sent them in different directions to seek out larger asteroids. On each segment, solar collectors spread their wings and began collecting energy for programmed tasks.

Once material and energy had been gathered, a new force was roused: microscopic machines activated by the influx of power. Certain strains were released to feed on the asteroidal matter waiting outside, absorbing it as they reproduced and changed. Spreading through the containing vessel they transformed it and themselves as new instructions from each segment's computer came into play. As the changes progressed, each section set a determined course and then settled into position at one of four equidistant points from the sun. Flooded with energy now, each segment's transformation progressed more rapidly and each took on an ominous appearance, elongating and seeming to take aim.

Three years had passed since the intruder had first entered the system, and almost to the day, blinding bursts of energy shot out from four points around the sun and converged on their distant target with unerring precision.

Jim Martin's fingers beat an impatient and silent drum-solo on the thigh of one of his artificial legs as his eyes flicked over the realistic-looking image surrounding him. He seemed to be sitting in a huge chamber, apparently lined with alternating panels of stone and rich, warm mahogany. The crowning illusion was the ebony, boomerang-shaped conference table which seemed to float majestically over a burgundy carpet, complete with scattered subsurface color LCD displays and old-fashioned touchpad keyboards.

Feeling frustrated, he glanced from side to side at the holographic images of the rest of Earth's three hundred elected representatives. They blithely continued their verbal square dancing, oblivious to his growing irritation. He kept shifting in his seat, trying to ignore the way the older representatives around him kept shooting disapproving glances at him. Their uniformly healthy but soft bodies and pastel-colored tunics were the norm, and he stood out among them because of more than his age. It really made him mad sometimes. He couldn't help it if he was a head taller than most of them, liked brighter colors and took pride in his well-developed body. Exercising was a way for him to relax. He did it to work off his frustrations of dealing with all the bureaucrats around him!

Most of them were probably happy about the way World President Saunders had slapped down his attempt to bring up the problem of the freepers and freds.

"The frozen sleepers and frozen dead are not going anywhere," she had said, rising regally to stand at the elbow of the illusionary table. Mara Saunders always took full advantage of her appearance to control a room. She was a tall, beautiful woman who, despite being

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well over a hundred years old, only looked to be in her thirties thanks to a skilled nanotech. She wore her shimmering auburn hair elaborately twisted and pinned up to add to her height and when she gazed down at somebody, she looked *down* on them. Everyone knew it. The way they had known when she had dismissed Jim's plea to start reviving the small viable percentage of the cryogenically frozen millions who rested in vaults all over the planet.

Her scorn had been the kiss of death for his attempt, and now the World Council had moved on to issues of weather control and farming, leaving him to fume over his uncharacteristic failure. He had finally managed to swing opinion in East America over toward differentiation and revival, now that they were able to distinguish the freepers and freds. He was tired of seeing the frozen lie forgotten or ignored, and bleeding his Region financially. And now, it had all been in vain.

"Four hundred thousand frozen bodies," he muttered, "do you have any idea how expensive they are to maintain?"

Next to him, the image of the EuroBlock 3 Representative, Marcel Dubois, frowned somewhere inside a bushy fringe of black beard. "Sshh! Stop complaining. We have over three hundred thousand in our block and we have only three million taxpayers to pay for them. You've got fifteen million."

"So why the chill don't you support me?" Jim asked.

"Because I'd lose the next election," Marcel answered. "My people don't want it."

Other Representatives started noticing their conversation and they switched to a private circuit, cutting off transmission except to each other.

"They're afraid of nanokillers," Marcel went on. Jim rolled his eyes. "Don't give me that look. It may have been over eighty years since the Machine-Plague, but people still remember. I still remember!" The almost invisible wrinkles around the Frenchman's eyes suddenly deepened with strain.

Jim had forgotten that Marcel was well over a hundred, thanks to the fulfilled brighter promises of nanotechnology. But the new technology had also had a darker side. Dubois had lived through the horror when, in 2040, terrorists had made off with a crop of American nanokillers, products of secret weapons research. The microscopic killing machines were germ-like molecular machines that replicated by absorbing and converting any handy matter. Accidentally released, they had spread like wildfire across a commuter world. Since they hadn't been programmed yet with specific targets or limits, they had indiscriminately killed any human in their path, ultimately wiping out almost half the world's population.

Whole cities had been virtually emptied before a desperately cooperating world managed to design and release a counteracting strain that sought out and disassembled the feared nanokillers.

Except it isn't a legitimate fear anymore, Jim thought in irritation. "They would screen for that routinely during any revival and have counter-killers in the revival solution."

Marcel shook his head impatiently.

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"There's more to it, Martin, and you know it."

"I know, like finding out someone you think *might* be alive and just suspended, isn't—"

"But has actually been a frozen corpse for over eighty years," Marcel finished. "That's a large part of it."

"But wouldn't it be better to know?" Jim asked.

Marcel didn't answer but just shook his head, reaching to cut the privacy circuit and resume listening to the meaningless blather of the other representatives.

Jim's fingers resumed their impatient and silent drum-solo. He was unaware of developments a quarter of a million miles away which would soon be taking his mind off his problems with the freepers and freds.

"Star, where in space are the power data on the launcher test?" Ken Miller's deep voice boomed across the vast, domed control room.

Serena turned from her terminal with a frown as she realized Star wasn't answering. A curl of her hair broke loose from a jeweled clip and tickled her nose. Under the Moon's low gravity, her slender two-meter plus body seemed to almost float. "Well, Star? Where is it? Dr. Miller asked you a question." She seemed to be twisted almost impossibly as she looked expectantly up in the air.

A deep, cultured voice that surrounded them spoke up, sounding confused. "Where is what, Dr. Andrews?"

"Blast!" She went over to a small cube that squatted in the middle of the floor, isolated by a clear area around it. Its featureless surface was unmarred except for several thick cooling pipes running through it. As Serena reached it, she gave it a swift, calculated kick on the one side. "The damned ear is thermal-shifting again!" She patted the computer absently on its top, smiling gently. "Sorry, Star." Then she turned back to Miller. "I told Engineering he needs better cooling at the data-volume we're running him. Ask him again."

Miller did, and in response the large screen on the one wall between him and Serena lit up with a colorful graphic display as Star apologized for not hearing him.

"There you go, Panda." Serena couldn't resist.

Miller sat back in his chair, crossing his arms over a substantial belly and sighed as he studied the screen.

Serena could understand Miller's reaction. Decades earlier, before he had come up here to the Moon, one of his students had noticed Miller's uncanny resemblance to one of the current residents of the San Diego Zoo. It had just taken one look at the ebony complexion and bald spot, as well as the carefully cultivated snow-white hair and beard. From that moment, Miller had been stuck with the affectionate, if less than dignified, nickname. It hadn't helped that the aging physicist's habitual choice of tunics only served to emphasize the similarity.

"Disrespect! That's all I get." He grumbled to the room in general, rolling his eyes wearily before narrowing his gaze on the display screen.

On the screen the stylized sun and its four helio-synchronous space-based laser launchers were indicated in black, while the laser-beams were spectrally ranked

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for output power and target accuracy. Numeric data scrolled by underneath, and Ken's eyes flicked between the two with total concentration.

Serena smiled as she saw how well the beams were balancing and targeting. But then Ken blanked her screen quickly.

"Atrocious! Beam two isn't aiming true. Not all the time, but there's a fluctuation that shouldn't be there." He shook his head in disappointment. "It may not be much at the distance of this test, but by the time a sailer gets out near the edge of the system, the beam won't be impacting the light-sail all the time."

"But we've been getting confirmation signals from StarStep on all arrivals—"

"What about future shipments? I don't feel comfortable just replacing Laser-pod #2 and retuning. We should have replaced the whole quad—"

"And who's going to pay?" Serena snapped.

"I know. Budgets, always the blasted budgets! I thought this was supposed to be the time of plenty and prosperity—"

"And complacency and maintaining the status quo." Then she remembered something that might cheer him up. "Did you see the latest status reports on the conversion?" He shook his head. "The planet is coming along real nicely." She spoke a few quick codes and new displays painted onto the huge viewscreen.

Ken's face split in a wide grin as he studied the data and he raised clenched hands over his head. "I knew those little microscopic buggers could do it. I told them! We'll have a nice little colony waiting for us to supply the people."

* * *

On a small planet almost six light-years from Earth, a multi-stage organism was growing. It had come to ground on barren rock over five years earlier. It was an organism unrelated to living things but which grew and consumed matter around it much the same as an organic counterpart would, except perhaps for its choice of nourishment. The lifeless surface rock of the planet was being broken down and transformed by certain explosively multiplying and spreading strains of the organism while other strains took the converted matter and absorbed it, using it as raw material to replicate and alter their own components.

These altered nanomachines went on to transform more of the planet's matter into finer particles of different elements to layer large areas of the small world with, as yet, sterile soil. Meanwhile, certain regions of the planet were invaded by another strain of nanomachines and matter was broken down into gases in carefully set proportions. As a side benefit, the planet's surface was sculpted and large depressions formed. The atmosphere thus formed was rarer than the tenuous envelope that shielded Mars, but it was slowly getting denser.

That particular strain of the synthetic organism would have to remain in isolated portions of the world even after it was invaded by the organic successors that would arrive, since the world's gravity was too low to hold a sufficiently dense atmosphere. But the programming was precise, and when sufficient air density was reached, the breakdown and conversion of all but specified areas of that strain would be triggered. The

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remaining nanomachines would go into dormancy until sensors indicated a sufficient drop in pressure to trigger them again.

"Today's meeting is adjourned." Saunders stood up finally to dismiss the circus.

Jim's tensed muscles relaxed and he reached to cut the holo-link. But the illusionary chamber remained around him even as its occupants vanished rapidly, one by one. From his right came a gentle throat-clearing and he looked over to see Saunders' image sitting there, a curious look on her face.

Apparently satisfied that they were "alone," she reached back to release her long hair. She shook out the tight spirals that had contained it and sighed. "Space, that feels better." Then she stretched her arms out gracefully in front of her and sat back, seductive in her relaxed pose. "These long sessions are killing me!" She studied him carefully for a moment, and then leaned forward. "So, Represent . . . Jim?" she asked, and at his nod continued. "So, Jim, and call me Mara, what was really bugging you?" She speared him with a piercing look that transformed her warm hazel eyes.

He shrugged, suspicious. She wanted something. "Like I said to everyone, we've got to face the Coolers and take care of the frozen—"

Saunders cut him off with a toss of her head. "You've been pushing that before, but never like today. Again, what gives?"

"You know about my accident?"

"Yes." She looked confused by his apparent change of subject. "I read about it. You lost both legs, I understand. So when are you going for regeneration?"

"I'm not," he answered.

"I don't understand, how old are you?"

"Sixty-five."

"Sixty-five? So why not go for regeneration? Chill, you'll be around for at least—"

"At most," he corrected her, "another fifty or sixty years."

"But the nano—"

"No good. My body can't tolerate anything beyond a Stage One Nanorooter. I found out after my check-up that my body seems to be sensitive to microscopic machines meddling too much with it. Stage Ones can keep me in pretty good shape up to near the end, but then I'll start to fall apart pretty quickly. My nanotech won't warranty me beyond one hundred and ten now."

Mara's eyes widened and the slightly cold and hard look that had covered her face evaporated. "I'm sorry. Now I understand." She made a safe guess. "And you're getting tired of wasting time. My apologies." Then her eyes narrowed again. "Let's see, you've been a Representative for three years. . . . you got elected Rep for Eastern America at only sixty-two? I'm impressed!"

He laughed. "Don't be. I think I got elected because the voters were sick and tired of my media blitzing and data-dumping. They probably figured I'd be less trouble in government than running for office—"

"And they were hedging their bets by figuring you might actually be of use by annoying us as much as them."

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"Very possible," he conceded. "But I got in. And as to your guess about my not wanting to waste time, you're right. When you suddenly realize you're only going to live a small part of what you had planned, it sort of shorts things out." His face clouded.

"Cheer up," Mara countered. "A century ago you would have been lucky to make it to ninety, and by the time you got there you would have been a doddering wreck. Even at sixty, you would have been slowed down pretty badly, and look at yourself! You don't look any older than your late twenties."

But as he listened to her, he was suddenly suspicious. "Tell me something, you're not hanging around just to cheer me up. What's on your mind?"

Her casual look vanished. "You're right. There is something else behind this little visit." He waited expectantly. "A challenge to you. We have a problem you may not be aware of but that you might be able to help me with." She leaned forward. "It has a solution, but it's an expensive one that I can't afford—"

"Politically."

"—to propose. Exactly. As world government president I'm kept up to date, at least in brief, on most major research projects." Jim leaned forward expectantly. "This particular source of concern is called StarStep," Mara began, a distant look in her eyes. "It was started in 2054, a few years before you were born. It was during the Clean-up, when nanotech research really took off to repair the world." She paused to mutter a few quick, soft code words and in front of them a large viewscreen appeared, seeming to float in mid-air. "The idea was to begin an interstellar colonization project to spread people out in case things got out of hand again. The world was in a panic and all the countries were involved. Even before the World Union. The decision was made to go interstellar rather than interplanetary, just to make sure that the project would be sufficiently isolated to be safe. It was an immense undertaking, planned in stages. Stage one involved constructing four huge helio-synchronous laser satellites that were used to launch a large solar sailer at the nearest solar system that was usable. Barnard's Star was picked. It's about six light-years away. It's a red dwarf, but there was a recently discovered small planet at the right distance to be usable." Responding to her sub-vocal command, the display changed to focus on a small red sun and three orbital traces. "It's a little small, but it's big enough to have a decent gravity. About like Mars."

Jim studied the display in fascination. "When was the survey sent out?"

"No survey. There was no need since we're rebuilding it." She saw his expression. "It was just a hunk of dead rock with no atmosphere. We checked." Jim relaxed. "Anyway, the first sailer was laser-launched in 2060—"

"How was it braked?"

"Something to do with the ionized gas between stars . . . I don't know exactly how," her shrug dismissed it, "and also reaction braking since fuel could be sent along and not have to be used until actual deceleration was started." She paused a second to regain her thought-link. "The first ship held a nanomachine package designed to construct a duplicate laser quad to act

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as a braking system for later craft. Eventually, it will be used to launch ships back to Earth." On the screen, the diagram reflected the stages she was describing. "After giving the first package time to do its job, a series of additional, automated vessels were sent out, loaded with additional nanopackages and genetically altered biological specimens. Bacteria, plant life, a full marine ecosystem and animals to form a complete ecology. The launchers here were operating continuously for years, sending ships out to be caught by the receiving bank at StarStep."

"How long's it take to get there?"

"About fifteen years, now that the receiving quad is in place and ships can be sent out at higher speed. The first shipment took almost thirty years to get there, needless to say . . . " she stopped a moment again, distracted by his interruptions. "Anyway, by now StarStep is well on the way to being a viable colony world. The conversion has been underway for almost thirty-five years now. It'll take a few more decades before it's ready for us, but things are going well. We get regular status reports, all positive, so far."

As she finished, she looked at his stunned expression and shrugged casually. "The basic idea was that, if nanotechnology can be used to clean up a polluted and war-torn world, why can't it be used to build us a new world entirely? Elsewhere. They would have preferred a more suitable system, but they didn't want to be too far away."

He stared at her, breathless as he considered what she was saying.

She saw his expression and shook her head. "Before you get too impressed at how much less sedate we are than you thought, remember, this was thought up almost seventy years ago." She sighed, a little wistfully. "I'm afraid that recently, we haven't been as supportive of the project as StarSteppers would like. That's the problem. The project is dying on this end. The way things are, we'll never get there. You aren't entirely wrong in seeing us as overly conservative at present. And this is one area where I think that it's a dangerous attitude. We *need* another home-base for humanity. Just in case."

"Enter an annoying and aggravating rebel like myself. Someone who might just be able to launch an otherwise grounded group of Representatives and get them to move on it." He smiled cynically as she nodded. "But what about the problem of the Coolers?"

"Drop it."

"Drop it?" He got up and stared down at her image, jaw clenching. "I've got voters depending on me to try to get things moving—"

"I said drop it." A hint of steel crept into her voice. "For now. This isn't the time for that particular problem. Make a nice show a little longer and then drop it. It won't be hard. The other Reps don't want to face the problem anyway—"

"But I can get to them if you give me a chance—"

"Yes, but I won't. I can't. And even if I did," she sighed, "I don't think you'll be able to convince them." She pointed to his seat. "Sit! You said it yourself. We have to accommodate the awakened freepers. Assuming 2 percent of the frozen can be revived, that's forty-thousand traumatized anachro-

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nisms. That's the problem, you see. We've changed more than just technologically in the last eighty-four years since the Machine-Plague. Our society has changed. More than in the thousand years before. The freepers won't fit in! And what's worse, they'll corrupt what we have. Our society is too fresh, too fragile to take it yet."

She leaned towards him, as if to reach out and touch him, and then leaned back quickly. "Chill! It's so blasted real since they eliminated the phase-flicker!" Looking embarrassed, she settled back in her seat. "You're young, Jim. You were born after the Plague, and have only carefully presented history to judge the past by. I, and a lot of the rest of the Council, remember it because we lived in it." She suddenly seemed to age fifty years as a tormented look passed across her face. For a moment, her eyes focused elsewhere until she recovered with a brisk toss of her head. "I'm sorry. I'm sure you can make a stirring speech to try to move them, and you may, for a moment, succeed. But then it will be forgotten. It would bring back too much horror. A lot of people are quite happy with the freepers just where they are. And even for those who aren't, it's still better than the thought of reviving the freepers and finding out just who survived, and who didn't. Added to that is the fear that any revived freepers will shake our peace with the same old hatreds and fears that led to the development of the nanokillers in the first place." She shook her head again. "No. It won't work. And it won't be long before your voters forget all about your noble efforts, either."

Jim finally realized what she really meant. "So we let them rot until they're all forgotten about; until it will be easier to pull the plug on them. After all, cryogenic suspension may preserve the body perfectly well, but too long, and their minds will be gone, and then they're no longer worth reviving."

She nodded sadly, chewing on her lower lip. "I'm sorry, I hadn't wanted to put it that bluntly, but it might be the only way. They won't fit." She shrugged.

He looked at her suspiciously. "There's more!"

"No! . . . Yes," she sighed. "You've heard of Crytron Industries?"

"Of course, they maintain the coolers—"

"All over the world! If your plan goes through—"

"They go out of business!" Jim was starting to understand. Maintaining the millions of frozen bodies was big business, with taxpayers' money! Most of the frozen had been suspended with inadequate, or nonexistent, financial safeguards for long-term storage. It had been a panic situation for most of them. And as for the pre-plague frozen, many of the financial precautions they had taken had been wiped out by the economic upheavals following the plague.

He had an idea now why Mara was pushing him. "I take it they have some voting influence?"

"You could say that! They got me elected president. I was a nobody junior representative in West America, but I had some bright ideas on how to boost the economy, which quite incidentally were advantageous to Crytron, too. So they sorted behind the windows during the first available presidential election

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and suddenly I was a 'name' and the only logical choice. I won by a landslide. Their landslide!

"Do they—"

"Expect favors in return?" She shook her head. "No, just for me to protect their interests. As long as I preserve the status quo—"

"A stable economy, a healthy business environment and so on. All of which are good for everyone anyway," he cut in.

"Exactly. I never felt too bad about it, because what they want is what the world needs anyway. And in return, they put their influence to work when it's necessary to push through any votes I may be having trouble with. It's been a mutually satisfying partnership for us and the world."

He could understand her and she sounded so defensive that he wished she was actually there as he felt a sudden urge to touch her, to comfort her. "So," he asked, "what else would happen if I managed to push through my plan, considering how much of a nuisance I can be?"

She shrugged. "I sure wouldn't win the next election, and we're only a year away from the end of my term." Her eyes were pleading. "I have to keep control right now, it's a critical period. There are a number of crucial pieces of legislation being formulated right now that are necessary to keep the world economy going properly. We're setting up new worldwide standards to try to stabilize things since nanotechnology made the precious metals standards obsolete. The temporary systems in use right now are awkward—"

"And you need me to back off so you can get reelected and keep pushing for a new standard?" She nodded. "I don't know—"

"Jim, you have to, please!" She started to reach for him again and then stopped herself, eyes suddenly hard as she saw the wariness in his eyes. He had suddenly realized how beautifully she was playing him and it must have shown in his eyes because she was immediately professionally controlled again.

"OK, deal time," she tried a different approach. "You help me and I'll help you. Later! When things settle down and we're a bit more secure, I'll back your plan with all my resources. I won't care about reelection then. I'm well off financially and I'll survive. And when we do push through your plan, then we can gradually revive the freepers, re-educate them and integrate them into society. But right now, it's not practical."

He considered her offer. Not a cancellation, but just a postponement. The freepers would not suffer for sleeping on a little longer, and the freds were terminal anyway, so, why worry? His eyes focused loosely on the hanging diagram of the distant solar system. "So this is to be my new project? Get StarStep moving?" It was a tantalizing challenge and he felt himself wavering. "It'll be expensive—"

"Horribly! You'll have to fight like never before."

He nodded, picturing it, starting to savor it. "You can't help me out?"

"No. You're on your own. I can't afford to be pushing something as 'expensive' as this. Crytron won't fight you on it, because it'll mean more business

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for them in freezing all the colonists. But it would be political suicide for me to push this kind of project." She rose. "Look, Jim. You think about it. I've instructed my terminal to accept your calls, just let me know when you want to discuss it further. Or, if you just want to talk. . . ." She didn't finish the sentence, but the unspoken invitation was clear. *An additional incentive?* he wondered. "Or, if you need more details, call Dr. Miller or Dr. Andrews at Luna-1. They've been instructed to give you full access to their data. Their codes are on your terminal, too." She uttered a quick command and the illusionary hall collapsed around him, leaving him sitting alone in a small chamber where slate and wood paneled walls echoed the illusionary larger chamber which existed only in binary code. Alone, to consider her challenge, and her invitation.

Walking shakily, trying to get used to the Moon's lower gravity, Jim glanced over at the imposing horizontal bulk of his escort, even as he kept an eye on his footing. He was fairly steady on his prosthetic legs now, but the one-sixth gravity was screwing up his coordination as they crossed the cavernous chamber of Luna-1's shuttle terminal.

He wondered briefly about Miller's bulk and it must have been obvious, because his escort laughed, a deep rumbling sound that seemed to echo.

"Yes, I could have this trimmed quite easily," Miller patted his belly fondly, "but we've been through a lot together. It's been carefully nurtured through 160 years of life and frankly, I'd feel lost without it. It makes me noticeable in today's homogenized society." He cocked an eyebrow at Jim. "But then, I imagine you know what I am talking about." He eyed Jim's muscled bulk respectfully.

At the same moment, both highly noticeable men burst out laughing. Around them, the towering slender Lunies pointedly ignored them. Miller clapped Jim soundly on a massive shoulder. "You're all right, for a grounder." Then he sobered. "But before we go on, I want to caution you a bit before I introduce you to Dr. Andrews." Miller extended a supporting hand as Jim stumbled in the doorway of the tubecar that would take them to StarStep Control.

"Reena is a Lunie," Miller began as they took their seats, "even though she was born on Earth, before the Plague—"

"Earth stock?"

"Lunie father, grounder mother who delivered on Earth. They had a fight and mom went back dirtside to deliver in 2030, almost exactly a hundred years ago. Then, after a few years her parents reconciled and Reena was brought up here. Then the Plague hit in 2040 and so she has never been back to Earth at all—"

"Since Luna-1 was cut off for several years. I know." Jim had read about it.

"Exactly. The Lunies had a pretty rough time surviving in isolation, since they weren't quite ready to be self-sufficient yet."

"That's right, a lot of them died from Spaids," Jim remembered one of his classes in school.

"Exactly. They didn't have the second generation nanoimmuners," Miller nodded. "It was ugly. The breakdown wasn't as bad as it might have been since the Moon's gravity did maintain the im-

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mune system longer than projected, but still, over eighty Lunies died from Space-Aids. But the survivors managed. Needless to say, by the time they were recontacted, there were a lot of hard feelings about not being rescued or contacted earlier—"

"Rescued?" Jim cut in. "They were better off here! They lost what, 3 percent of the colony? Earth lost half its population!"

"Um, yes, but it's the idea that's the problem here. And it's still shaky. When Earth gave them the second-generation nanoimmuners it just made things worse. It made the deaths of the Lunies seem useless, wasted." Miller pulled absently on a tuft of frosty beard. "But now it's more of an isolationist pride that keeps them aloof. So, bear with her if she seems a little . . . cold." He chuckled, a deep and resonant sound that filled the little tube-car. "Space, you should have seen the reception I got. I've been here 70 years now, since we built StarStep Control, and I really got the turned-back treatment!" He gave a mock shudder. "But like I said, bear with her. She's good. A little idealistic at times, but sharp. She virtually programmed Star by herself."

"Star?"

"Our Brain." Miller looked proud. "The finest in Nanocomputer technology. The complexity of a human brain, but with the speed and storage of the most powerful superconducting network systems. The blasted thing thinks it's a person!" He shook his head. "Space, but that thing sucks coolant though! It . . . he," Miller shrugged, "designed and programmed the NanoMods for all the shipments, with Serena's help of course."

"I can't wait to meet him, and your Dr. Andrews. And to have them hear my news," Jim started cryptically, but then decided to hold off explaining his presence until meeting Andrews and Star.

The tube-car continued its humming rush towards StarStep Control as they sat in silence the rest of the trip.

Jim glanced nervously at the slender support beams for the huge telescope that loomed over them under the vast arching dome of Observatory/Control, and then forgot about it as Andrews was introduced. They eyed each other warily and Jim tried not to stare. He felt hopelessly squat and chunky compared to the beautiful programmer. Her eerie light-blue eyes were almost glittering silver in the reflected light. Strands of black hair were escaping the loose top-knot on her head to hang over her forehead and beads of sweat dotted her face from working around an overheating terminal, but he was captivated.

The first thing that struck him was her fluid grace. She moved like a ballerina, totally at home in the one-sixth gravity of the Moon. She was slender like a figure in an El Greco painting, and almost twenty centimeters taller than him. It was a strange feeling. But for some reason it only added to her appeal, her other-worldly fascination. He was relieved she wasn't a born Lunie, though. They were even taller. Some over two and a half meters!

"Mr. Martin, why did you come up here? Is there a problem with our fund-

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ing?'' Her softly musical voice held more than a hint of suspicion.

He realized her concern and smiled, even as he realized that Miller was spearing him with a calculating look that was just short of laser surgery.

He decided he had better explain, quick. ''On the contrary. I am trying to increase your funding and give you everything that you need, and hopefully a little surplus.'' The open-mouthed stares that greeted the straightforward statement made the whole trip worth it. Suddenly Serena bombarded him with questions while Miller watched intently. Jim held up his hands. ''Pause, wait a minute!''

When they quieted down he looked around and spotted a chair by one wall. He walked carefully over to it and seated himself, ignoring the impatient glares aimed at him. ''There, that's better. I feel like I'm going to fall flat on my face any minute. Sorry. Like I said, I'm trying to get your appropriation increased, but it's not going to be easy. And I know, you're wondering why the chill we suddenly care.''

From the looks on their faces, it was clear that their earlier suspiciousness was back, now that the initial thrill of his statement was wearing off. ''Well, you're right, I have an ulterior motive.'' He explained the concerns prompting the push to revive StarStep, omitting Mara's help and just vaguely mentioning that there was high-level pushing behind the plan.

As his words sank in, a contagious excitement came over the others and he found himself wrapped up in an all-encompassing bear-hug from Miller and pressed delightfully close to Serena. Exotic silvery eyes stared into his, suddenly twinkling mischievously as they met his gaze. Not at all distant or aloof anymore, but interested and openly appraising. All thoughts of Mara's invitation evaporated.

The nanomachines now covered the planet and reached deep within it. Over ten years had passed since the probes that had carried them had landed on the once-barren world. New strains were developing continuously as planned further programmed 'mutations' occurred.

Organic molecules were worked into the soil. And in the depressions that had been sculpted into the planet, oxygen and hydrogen were combined, along with other elements. The atmosphere was still too rare to allow water to remain liquid for long, but the evaporating fluids were carried aloft, distributed through the atmosphere, and infused into the dusty soil which now covered large areas with a blurring blanket that softened the harsh contours of the land. Some of the water-producing nanomachines also would have to stay active since some moisture would be lost along with air because of the lighter gravity.

And now that the hordes of nanomachines responsible for soil formation were being broken down to become a part of that blanket, the next step began. Far above, in recently arrived and carefully designed chambers on board orbiting modules, various organic soups were brewing. Specific strains were periodically launched to crash on the planet below.

Life had come to the barren world, and more was on the way. The plan had been very precise.

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"Well?" Mara looked at him expectantly. "How did it go?"

Jim gave her a cautious smile. "Not bad. Star, their Brain, reworked the budget figures for getting StarStep back on line properly and I've been doing some figuring of my own. The biggest problem is that the actual colony ships still only exist in memory and have yet to be built. Those, and the training facilities. But building the ships and freezing the colonists are the big hang-ups. There's only operating capital left. Ship construction will be the big expense, but even the cryogenic preparation of all the colonists will cost a lot. The plan calls for twenty thousand settlers!"

"Crytron ought to be happy," Mara injected cynically. "So now your fight begins." Mara's face was full of concern. "It'll conflict directly with our budget constraints—"

"Like you said, Crytron ought to be happy. Have them push behind the scenes. The damn budget constraints are artificial anyway, because everyone's afraid of crashing again!"

"Can you blame them?" Mara's voice was soft as she laid a gentle hand on his arm. "I already told you. Most of the representatives are close to my age," her eyes dipped in brief embarrassment, "and they . . . we," she corrected herself, "have seen what happens when there is a technological explosion."

Her hand lingered warmly as she turned and looked towards the window, pointing out over the park-like scene outside with her free hand. "Look out there and you see a city and a country, no, a world at peace. A world untaminated by pollution—thanks to cheap fusion power, improved solar systems and a nanotech clean-up. It's a world with plentiful resources for all—" She laughed, interrupting herself. "Even if it means some complications like with our money-standard." She faced him earnestly. "We have seen the world go from the fragmented mess of the early millennia, to total devastating chaos because of stolen nanoweapons, and then, at the very brink of total annihilation, just barely rescue itself from total doom. And now we need a rest. Those budget restrictions you're complaining about were designed to maintain the status quo for a while, to give us time to reorganize. That's why I wanted a rebel like you."

"Well, you've got a deal." Gently, he disengaged her hand, his touch lingering long enough to let her know he understood, but declined, her subtle invitation to greater intimacy. He had already made up his mind, without needing further persuasion.

Briskly he turned and began pacing the floor.

"I'm going back to the way I got elected, but on a worldwide scale." He grinned a little maliciously and pulled out a pocket computer, speaking in a private verbal shorthand he'd programmed in. The grin spread and he could see that it worried Mara. After a while, he settled into a chair and kept quizzing and responding to the computer.

It took over twenty minutes, but then he stopped and got up and went back over to Mara. He held out the computer so she could inspect the small floating holo-display. "As I said, I'll help you.

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But to get going, I'll need a personal donation from you of twelve million—''

''Twelve million?'' Mara froze, staring at the read-out in disbelief. ''I don't . . . '' She stopped, eyes flashing back and forth between his terminal and his face. ''I take it you just tapped into my records?'' He nodded innocently as she shrugged. ''Well, I do a little stock trading here and there—''

''You're well placed for information—''

''I don't—''

''Of course not!'' He shook his head. ''No, I'm sure you don't, exactly. I noticed you owned no Crytron stock, but there are ways . . . '' He let it hang there with a shrug. ''Look, I don't care. But if you want my help, I need funding for my campaign and twelve million is what I need to get started. Once I get in orbit, I can get donations and use fundraising to keep going, but to get off the ground I need a boost. Use an intermediary and make it a donation to get me started; better yet, use several, and then step back and leave me alone.'' He noticed her nervous look and smiled. ''You're going to have to distance yourself from me as much as possible because in a while I'm going to be very unpopular.'' She looked slightly wistful for a moment. ''And you're going to have to be the saving grace that steps in to stop me by giving me a token appropriation to settle down and to get me off everyone's backs. A token that will be what we need, instead of what I'm going to be demanding.''

''It'll cost you the next election.'' Mara warned, all business again.

''So? It's getting boring anyway. Too much inertia. I wasn't getting anything changed. Once we get the funding together, I figure I'll see about joining the team on the Moon to plan the new world. Give Star some input, and some ideas.'' He smiled. ''Anyone who'll take a chance on heading out there,'' he nodded at the ceiling, ''has to be more my type than the fossils taking up space down here! Present company excluded.'' He smiled again.

''That's going to be part of your problem. Getting volunteers to colonize StarStep.''

''Don't underestimate the power of a good media blitz!'' Then he headed for the door, a look of hungry anticipation on his face. The battle was about to begin. ''I have your private number. When I get organized, I'll let you know where to make your donations.'' He left Mara standing by the window, looking almost like she wasn't sure she'd made the right choice.

Thirteen months later, Jim sat staring out the Plasteel window of Luna-1's observation dome at the blue-green globe hanging in the velvet night above. Inside he felt at peace and knew he had made the right decision to move out here, even if it would mean spending a lot of time in the centrifuge to keep up his strength. He felt the bulge of Serena's holo-disk under his shirt and fingered it tenderly because he knew that she would soon be with him all the time, not just during his intermittent visits.

Their mutual interest on that chance meeting had not escaped Miller's attention. He had played matchmaker with a vengeance. At every opportunity, he had arranged to get Jim and Serena

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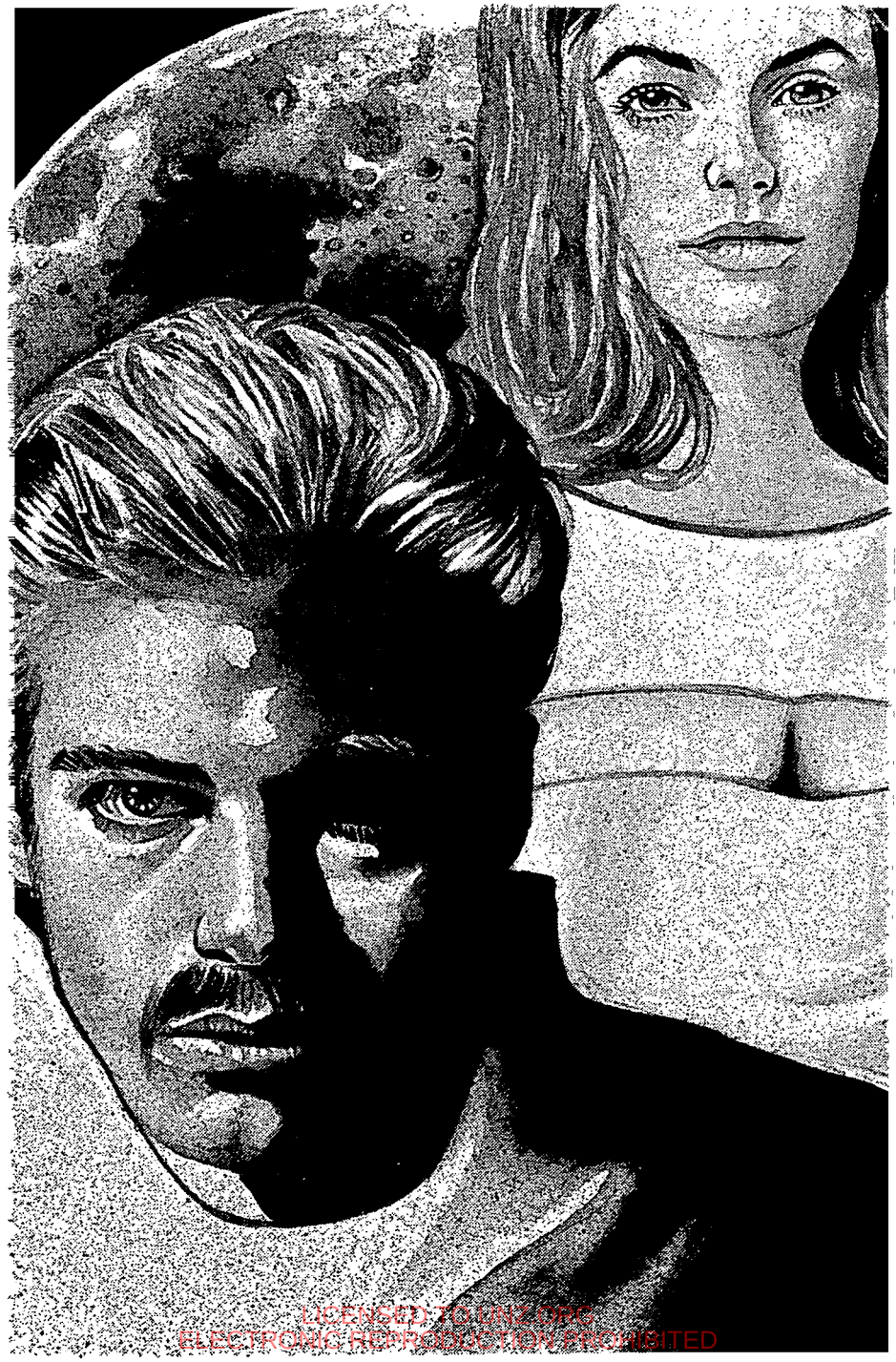

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working together or meeting socially by "accident." He had been worried about the way Serena had been isolating herself after her fiancé had decided he couldn't handle her work demands.

Jim had not resisted Miller's pretty obvious efforts as he got to know Serena, and it even became a private joke between the two of them to try to figure out how the portly physicist would try to throw them together the next time. But as Jim had made up his mind, and heart, he started feeling like a pixel in a video game. He had been constantly going back and forth between Earth and the Moon in his efforts to keep prodding the legislature groundside and coordinating planning on the Moon. Almost without realizing it, he had found himself taking on more and more administrative duties for running StarStep in addition to his fundraising efforts. It had been a harrowing double responsibility, but he had felt more comfortable keeping full control of everything until he had accomplished his goal.

Which he had finally done.

Just the day before, he had left his Earth office with word of the final Council vote on his demands. As he had promised Mara, he had made such a world-wide nuisance out of himself that the assembly had given up and almost unanimously voted more funds for StarStep: nearly double what Star had projected as the minimum necessary for completion. Needless to say, Jim had put on a great show of fuming about the stinginess of the appropriation and had been suitably ungrateful even while he had been bursting to get back to Luna-1 and break the news to Miller and Serena. It would not be made public until all the final details had been worked out so the news would still be a surprise.

Of course, he had not been able to keep it from Serena. It had slipped out when he had placed his daily call to her.

His only remaining concern was the lack of a strong base of potential settlers for StarStep. That was going to have to be the next step, using some of the extra money his campaign and appropriations had raised. There had been almost no response to his call for volunteers, and he was going to have to revise his plans some and start a new media blitz.

Then a familiar booming voice broke into his reverie from behind. "Well, well! Our favorite grounder, just bursting with the news that hit Luna-1 about eight hours ago—"

"Panda!" Serena cut Ken off by putting a slender hand over his mouth even as she leaned down to give Jim a hungry kiss. "Missed you, lover," she whispered. Then she turned to Ken. "Let the poor man bring us his own good news."

Jim forced himself to concentrate on why he was here, belatedly realizing what Miller had said. Apparently some news service had gotten hold of the vote results and broken the news prematurely. Sheepishly he detailed the Council's decision, trying not to be embarrassed as Serena settled down in his lap with an impish smile and a decidedly familiar wriggle. She loved to try to unsettle him and did it again by suddenly hitting him with budget requests at the same time that she shot technical questions at Miller. He finally threw up his hands in surrender and pulled out his computer to interface with Star.

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Before too long, they were satisfied and were trading suggestions back and forth in a rapid-fire way that left him dizzy as they planned what to do, now that they actually had enough funds. And as he looked from one to the other, an idea began to grow.

After a while, Serena suddenly stopped and looked closely at him, suspicious of the half-smile that was tugging at his mouth. "What are you up to now?"

He leaned back and shook his head. "Uh-uh. You'll see."

One large ocean and a number of small seas now dotted StarStep. The lighter gravity gave tremendous shifting life to the large masses of strange new fluid, speeding the spread of life throughout it. Life from frozen specimens brought along. Specimens genetically altered to breed rapidly for a number of generations before reverting to normal as gene clusters broke up under differentiation. Microscopic life, too, swarmed in the waters and across the landscape. And vegetation was appearing in numerous scattered areas of the world as seeding was guided by carefully planned programs that controlled an army of utility machines assembled from the formerly barren world. Strange-looking vegetation, freed to grow into sizes and in directions that would have been impossible under Earth's heavier gravity. But they were plants that were healthy and strong, adding to the atmosphere that was now becoming dense enough to support life.

Another planned stage had been reached. A signal went out over the laser link aiming for an Earth of about six years later. "Stage four finished. Estimated completion time, forty Earth years." It had been only thirty years since the project was begun.

A glittering belt of vessels hung in orbit, each preparing their cargo. In many were animal specimens, genetically altered, as had been the early marine specimens, to breed quickly and spread until certain encoded limits were reached. A carefully selected number had been distributed, but many others still waited to be thawed. And from other ships, a steady stream of similarly altered vegetation continued to emerge to be shuttled to the surface and distributed.

But a meteorite had punctured one vessel and slightly damaged a computer subsystem responsible for preserving representatives of one of the animal species being prepared for introduction to StarStep. For a short time, the temperature climbed and a minute amount of damage occurred. Then automated maintenance systems took notice of the failure and quickly made repairs.

Their roles were reversed this time as Jim rose to greet Mara. When his secretary had disappeared, Mara looked critically around the sumptuous office and started to open her mouth.

He stopped her as she sat down in a comfortable leather recliner in front of his floating stainless steel MagnaLev desk. "Paid for by myself. Your contributions were only the seed money. To date my campaign raised . . . well, substantially more than we needed. I am both loved and hated, but I benefit by either being paid off, or by being supported. And as for all this . . ." he swung his chin around the expensive

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furnishings as he dropped back in his own, matching seat. "It takes an image to raise money properly."

"So why the personal invitation?" She looked uncomfortable.

"Because I'm afraid I'm not finished making a nuisance of myself, and I figured that I owe you the courtesy of telling you my plans. And don't worry about us meeting. This time I'm calling on you and you needn't worry about guilt by association. You see, you'll have no choice."

Mara was suddenly wary. "What plans are you talking about?"

"Only to fulfill a promise I made. To my voters, and to the council—"

For a moment her face was blank, and then guarded suspicion crept onto it. "Not the thing with the freepers and the freds again?"

He grinned and nodded.

"I thought I told you to drop it. I thought I explained—"

"The election's over and you won—"

"But my plans, and implementing them—"

"We had a deal and I'm holding you to it. Your plans will survive. You have a lot more power consolidated than you let on, or perhaps more than you realize. . . ." He studied her, "No, you know damn well what you have. You just don't want to reveal it and fight full force. Sorry, but you've got no choice now. I made a promise and I intend to keep it. You're turning your back on a lot of people who trusted a more benevolent future to revive them from a living nightmare. Sure, a lot of them were cowards, but blast it! The Machine-Plague was not a result of governments losing control. It was terrorists who let loose the plague. And the frozen were just regular people who were scared. They deserve better than being locked away in concrete vaults, forgotten until their brain patterns deteriorate, and we just have fresh-frozen slabs of meat!"

Without realizing it Jim had risen and was leaning over his desk on clenched fists, staring into Mara's face, his voice rising angrily. Mara had shrunk back from his verbal assault. *Probably the only time she had backed off from anyone in ages,* he mused, and he dropped back into his seat feeling embarrassed. "I'm sorry, Mara. It's just that—"

"You take this all very seriously." She looked thoughtful. "I hadn't realized just how seriously. But what do you want from me?"

"Just to stay out of my way. I'm going to push for differentiation of freepers and freds with termination of the latter—"

"Do you have any idea what that's going to mean? It'll make the abortion battles of the twentieth century look like a kindergarten class! They'll—"

"Try to tear me apart. I know. We're going to have to start by thawing out a number of each, proving we can tell the difference between them."

Mara looked suspicious. "There's more."

"True." He conceded with a nod. "I want guardianship of the freepers."

She sat up, staring at him, understanding starting to show on her face. "What are you planning to do with them? As if I can't guess."

He nodded. "StarStep finally has the funding it needs, and all the status reports have been good, but what it lacks

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are potential settlers. I expected to be able to paint it up nicely with a good media campaign, but it flopped. I can probably still make it look good enough that we'll have some settlers, but I had another idea—"

"Using the freepers."

"Exactly. They're already frozen, that cuts the expense of having to freeze out thousands of colonists. I figure that with those savings and the excess funding we now have we can increase ship capacity and send out forty-some thousand settlers instead of only twenty thousand. It'll still be cheaper since most are already frozen and—"

"Suddenly we're thinking cost-effective?" She interrupted drily.

He smiled. "Sure. I'm not stupid—"

"Just annoying," she finished.

"Right. Anyway, they're already frozen. We only need to put down a limited number of people to act as orientation and supervisory personnel. Crytron won't be happy. Especially after the way they've helped me, but that's too bad. Basically, we just need bodies. Robots and nanomachines will handle most of the real work, except for exploring and classifying. That will be easy to teach the freepers."

"How do you think they will react to suddenly being away from Earth, totally cut off from what they know?"

He shook his head and leaned forward. "That's just it, they won't be. If we revived them here on Earth, we would have two options. One, to scatter them across the world for individual acclimatization, in which case we'd have forty-some thousand separate and traumatized individuals trying to adjust to a whole new world with different rules and habits. Or, they could be revived together and oriented together, which would develop a strong bond between them all which would be shattered when we'd have to break them up for financial reasons. After all, it's not likely that any of them will have usable skills in this day and age. One region can't be expected to support all of them."

He spun in his chair a moment, looking out the window at the crystal clear sky and sighed. "Then they'll again be thousands of scattered, lonely individuals, living their lives out on welfare, no doubt growing to resent us. Oh sure, some of them can probably be retrained to some menial jobs, but there aren't that many of those any more. And we're talking professional people here. After all, they were able to afford freezing. And now, all of a sudden, they're being relegated to obviously makeshift labor." He turned back to her. "Balance that against being awakened to a new world and being told that in exchange for being healed, saved and revived, they'll be asked to help build a new world together. We'll use whatever skills thay may have. On StarStep, it may actually be an effective way of doing things. In exchange for doing this, they'll be 'working off their debt to us' and will be doing something useful. And, they'll be in control of the new world and responsible for it. Psychologically, that has to be better than being welfare cases in a hostile world. A lot of people here on Earth will fear them, maybe even hate them because of the false idea that they were somehow responsible for the Plague."

As he finished, she was leaning back

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in her chair, eyes closed and hands clasped with steepled forefingers that supported her chin, poking a shallow dimple. For several minutes she sat silently like that, while Jim waited patiently. Then her eyes opened lazily and she looked at him with new respect. "You've planned this well. Tell me, I'm curious. Will you go along with them?"

He nodded. "Yes. There's nothing for me here on Earth. I've already moved to the Moon, although not just because I'm not going to be the most popular after this." He thought of Serena and looked over at the holo-pic she had sent him, feeling like he would cry. He loved her, but she would not be able to come along to StarStep because of the heavier—to her—gravity. Twice what she had grown up under. He wondered again if he would be able to bear leaving her, but he couldn't just stay on the Moon after StarStep was launched. He sighed and looked back at Mara. "I had thought of staying on the Moon, but it's too small an environment for me. I need more room, more challenge—"

"And being part of building a whole new world—"

"A whole new society!"

"Qualifies, I would think, as a little more challenging." She smiled. "Yes, I think I understand. Well. I'll stay out of your way and let you do your thing. . . ." Suddenly she frowned. "No, blast it!" She sat up sharply and leaned forward. "It's time I started taking a little responsibility myself. I can certainly make things a little easier if I get behind you and push. If Crytron tries to force me out or make trouble for you, they'll find it a lot harder than they'd ever guess!" Her lips compressed. "As you said, I have a little more power consolidated than most people suspect. Just for a time like this." She got up and leaned forward across his desk to face him. "I'm not going to let you have all the fun."

Then as they stood just inches apart, her smile changed slowly to a more speculative one and her hand reached up to trace the line of his chest. "And even though this is all settled, the invitation is still open . . ." Her voice was suddenly sultry.

He intercepted her hand and brought it to his lips for a soft kiss, as he looked into her eyes. "At one point I was interested, very interested," he admitted. She was an extremely appealing woman, physically. "But I'm afraid that someone else staked claim to my attentions."

"Ah yes, the good Dr. Andrews." Mara glanced at the three-dimensional image of Serena on his desk and smiled regretfully. "I forgot about her, though obviously you didn't." She reclaimed her hand, suddenly the crisp politician again. "Pity. I have a feeling it would have been a very interesting experience." She shrugged. "She is rather exotic looking. But then," she cocked her head studying him, "so are you."

A year later, Jim remembered Mara's comments as he looked down across the lean figure of Serena's sleeping body. His eyes caressed her tenderly. Even in sleep, a gentle smile played across her features and he had to return it as he saw how a wisp of her hair was dancing in front of her, alternately suspended by her exhalation, and then slowly trying

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to settle under the low gravity before the next breath set it to dancing again. Always in motion.

He thought of Mara's comment and mentally compared the two women. Both were beautiful, each in her own way. Mara in a classical, fleshier sense. Healthy and trim, as was almost everyone these days, but as generously endowed as a Greek statue. A woman who with her mind and bearing virtually ruled the world, but who could still, in moments, change into a sultry temptress. But she was a woman whose interests were limited to a narrow range, all concerned with maintaining her position and the status quo of her world. Her control. Those were her games.

In contrast to her, in all senses, was the sinewy slender and seemingly elongated Serena. A little unsettling at first perhaps, to some, but with a powerful beauty of her own. Through her eerie eyes she looked at the world with a mind that was forever questing to understand everything encountered, fueled by a powerful intellect. Yet she was not the cold analytical person she could easily have become, because she had an impish sense of humor and loved to poke fun at both herself and situations that caught her eye. And beyond all that, she was a warm and passionate person who had found a soul-mate in Jim.

This was the person who held his heart.

He felt a growing tightness in his chest and squeezed his eyes shut. For the past year he had been increasingly torn by conflicting questions. How could he leave Serena? He had won, finally, and the freepers were his to use. But did he have to go with them? Would he grow to resent Serena if he stayed? If he did go out to StarStep, how could he bear leaving Serena? How could he ask Serena to leave the Moon and go with him; leave all her friends and the tightly-knit society she was a part of? It wasn't fair. And there was the damnable gravity of StarStep. Twice the Moon's. That alone would seem to condemn Serena to stay on the Moon.

All questions; no answers.

His eyes opened, a line of moisture creeping down his cheek, and to his surprise he realized that Serena was awake and watching him with a serious look on her face. But as she saw his eyes open, she laughed gently and a smile warmed her face.

"Hey there, Lover. I'm glad you're awake. I've got this problem I needed to talk to you about." She propped herself up on an elbow and leaned forward to give him a quick kiss. "You see, I have to leave the Moon. There's this project I'm working on, and the computer I programmed is going off-world to organize a new colony and I have to go along to keep it running. But there's a problem—"

"And what's that problem, pray tell?" He tried to keep his tone as light as hers but could not keep a betraying tremor of emotion out of it.

"Well, I have this friend, you see. A grounder. A big wreck of a man, but I've sort of gotten used to him and I kind of like having him around. . . ." for a moment her own voice cracked, "and he thinks we won't be able to stay together—"

He couldn't take it anymore and cut her off by grabbing her in a tight embrace, crushing his lips down over hers

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for a long hard kiss. After a long moment he partially released her and leaned back, eyes unashamedly wet. "You're coming?"

She smiled gently. "Hey, Star needs me . . . " She placed a finger over his mouth lightly: "Shh . . . I know, you do, too. It's mutual. Besides, it ought to be fascinating! A whole new world, and a whole new culture to mold."

"What about the gravity?"

"I was born on Earth, remember? And I use the centrifuge on a regular basis. Especially since we've been together. You are a lot stronger than me, you know and . . . at times you squeeze a little harder than you may realize." She gave him an impish grin. "It's just self-defense! I'll go on an intensive training program until we're frozen for the trip, and then while we're asleep I'll have some nanorooter redesign to strengthen my bones and muscles a bit."

His eyes widened. He hadn't even thought about that. He was so used to not being able to think of nanotechnology being used to alter a body—because it didn't work for him—that he hadn't thought about its possibilities. But as he did, he was struck by another thought. "But you're going to be around a lot longer, I won't live past 120 or so—"

"Suck space! You forget that I've designed whole ranges of nanomachines. Maybe the standard rooters they used on you didn't work, but wait till Star and I put our brains together. We'll fix you up. You need new legs, and I'm sure not going to let you get away with just giving me another few decades. We'll need a lot longer to get StarStep going properly. Chill, it'll be another few decades before we can leave here. If StarStep's on track, it won't be ready for another forty years or so. And once we get there, we'll need your . . . determination—"

"Stubbornness!"

"That too," she grinned again, "to keep the revived freepers working together and to keep them from killing each other. . . . " Then she broke off, grabbing him with a choked sob as her composure crumbled. "But I'm scared!"

"I'm scared, too—"

"You don't understand, dear," she interrupted gently. "I've been going over this in my mind for months, trying to get up the nerve. I can't explain the bond that I have for the Moon and the rest of my people. It's very special, and very unforgiving! For one of us to even consider leaving is unheard of. Almost a phobia, in some ways. Can you understand that?" She was almost pleading.

He swallowed, starting to realize what she must be going through. He had not considered that aspect of her decision. It made sense when he thought about it. They were trapped by physiology, and psychologically they had been forced into a bond because of their isolation and problems during the machine plague.

He was suddenly overwhelmed that she had decided to come with him and gripped her one hand tightly. "Are you sure you want to go?" he asked when he was able to speak.

"Space no!" She laughed nervously. "But I can't back out. The opportunity to expand Star's horizons like this. . . . " As usual she took the opportunity to tease him.

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"Shh," his turn to silence her. "I know, I can't back out either. I don't want to." He kissed her forehead gently. "Tell you what. We're going to be the first to walk on StarStep and we'll claim the world together." He stroked her hair as he held her, feeling her warm body mold itself to his. "We'll work to build a new world, one where we can be together for a long time." He felt her grip tighten convulsively for a moment and then relax as she sighed, and suddenly he felt her hands begin moving in new, more insistent patterns and he surrendered happily to them.

In a carefully sealed and silent city, a signal was received. Non-living minds awakened to begin preparing for those who were coming and mechanical figures roused from dormant states to activate food processing machinery. Other robots began preparing the liquid baths of specialized nanomachines that were designed to revive a long procession of frozen bodies soon arriving from the large ships now in orbit. Key crew on the ships would already have been revived to supervise the transfer and revival of the bulk of the colonists. It was more practical to revive the rest after they had been transported down to the city.

The city had been built along the shore of the primary ocean of StarStep—on top of a cliff that was high enough to shield from storm-whipped waters. The city was surrounded on three sides by a plain of impossibly tall grasses that merged into a near-jungle of surreal trees. A wide range of strange animals foraged through the trees and made their home among them and on the grassy plains between the forests. They still lived accelerated, but gradually slowing to normal life-spans of rapid breeding and diversification. Generation by rapid generation, they had spread and adapted to a planet different than that their ancestors had been brought from. They bore little resemblance to their progenitors now. Impossibly slender and tall, they floated gracefully through their world. Some in the trees and others across the plains, seemingly at home wherever they roamed.

One of those animals watched the city. A feline shape whose skull was slightly larger than it should have been and whose paws were wider and equipped with longer toes than it needed. And it stood erect! The being watched the waiting city and sensed a difference that brought a rumble to life from its throat and caused its fur to ruffle slightly.

In the city, there was a movement where there should have been none, and new odors drifted out across the plain.

And from the sky a large shape glided silently to a landing on a large concrete strip outside the city. For a moment it just rested there, but then a door opened and two figures stepped out. A tall slender one, accompanied by a slightly shorter and stockier one. For a moment they stood looking out over the fields at the forest, and then they embraced each other.

In the woods, the watcher growled again, already picking up the new acrid odor that the wind swept towards it. It backed away and then seemed to vanish as it melted back into the woods, its dappled coat blending with the shadows to conceal it as it returned to its clan to report the arrival of the newcomers. . . . ■

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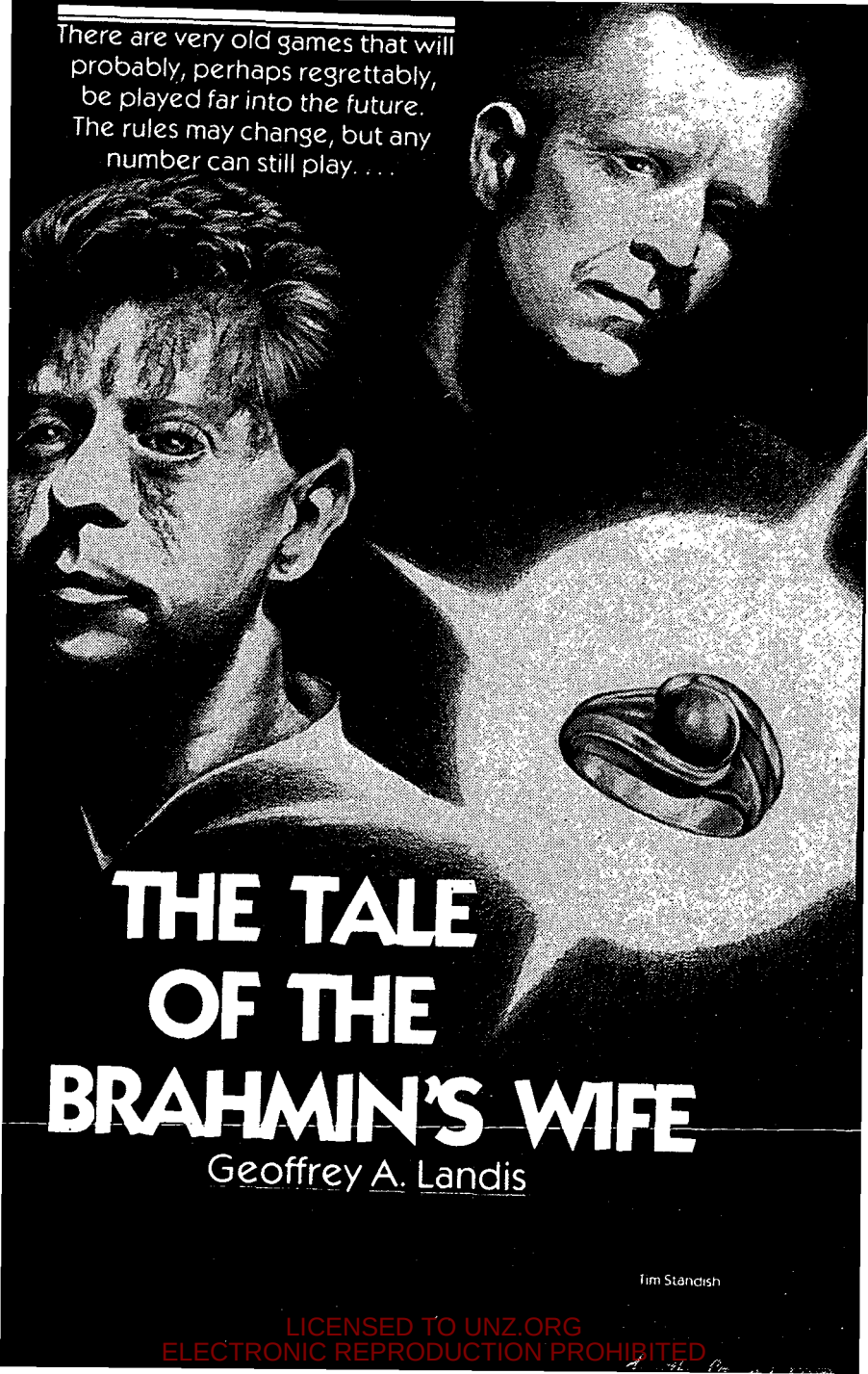
There are very old games that will probably, perhaps regrettably, be played far into the future. The rules may change, but any number can still play. . . .
THE TALE OF THE BRAHMIN'S WIFE
Geoffrey A. Landis
Tim Standish

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1. *A Morning of Onyx and Pearl*

Wispy fog like an air of age and mystery hangs over the city. Tendrils of mist rise from the canals like uncertain wraiths, to hesitate for a moment in the air, then spin away on urgent business in silent eddies behind speeding waterstriders. Overhead, glass-filament bridges like spiderwebs spun of metallic candy arch across the canals. It is a baroque and jaded city, a city where you can get anything if you know where to ask: love philters of guaranteed efficacy, amulets of power crafted by long-forgotten alien hands, strange sensual pleasures to titillate the jaded, or silent death for those more jaded still. It is a city of the very rich, and of the desperate poor.

It is all this and more.

It is Boston.

The water taxi coasted to a stop, settling into the dirty green water. Elliot Sheridan Winthrop spoke a word to the driver and stepped out. It was, perhaps, a sleazier part of town than the Beacon Hill clubs and brownstones he might normally be used to.

The breeze was damp, and he wrapped his cape tighter around his body. The jewel at his throat glistened for a moment in a vagrant beam of sunlight as he hesitated for a moment, then entered the discreetly marked storefront office.

The 'eye spread the photos out for him. Elliot bent over to look closer. Anne eating lunch at a trendy canalside restaurant, alone. Anne reading a book, elegantly bound in gold-embossed plastic. Anne wandering through the Gardner Museum, her eyes wide and quizzical. Anne at the store, indecisive over a selection. Anne taking a bath, half-hidden in a fairyland of bubbles. Alone. Alone, alone, alone. "She's clean, Mr. Winthrop."

He shook his head. "You haven't looked hard enough."

"We're the best in the business, sir."

He knew that. If they hadn't been the best, he wouldn't have hired them. "She's fooling you."

The detective frowned. "If you could give us even a hint of reason *why* you suspect she's deceiving you, then maybe we could . . ."

The pale blue stones on Winthrop's bracelet shimmered in tones of orchid. He paused, concentrating on slowing and deepening his breathing until it returned to a quiet milky blue. "I don't *suspect*. I *know*. And if you can't find out who it is, then I will go somewhere else. Good day."

"That, of course, is your choice, sir. Our courier will bring your final bill in the morning. But if we can't find him, then nobody can."

Elliot knows he cannot be satisfying her, though she may pretend otherwise. A young woman like her, ripe body, full of life. She will have a lover, he knows, someone who will give her what he cannot. When he confronts her with the evidence, she will tearfully confess, say how she couldn't help herself. They will have a joyous reconciliation. After, he will give her his blessing, warning her never again to attempt lying to him. He had no need to fear those young studs. They could give her physically what he could not, but in the end, he would hold her with his poetry, his culture, his con-

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versation; areas in which no young stallion could possibly compete. She will always return to him. This he also knows.

But who? *Who?*

Perhaps she had corrupted the detective, he thought, striding purposefully into the mist-entwined air. Perhaps they were in collusion, laughing at his foolishness. With a sudden impulse he tossed the folder of information the 'eye had given him into the Marlborough Street canal. A single still of Anne slipped out and hovered just under the water, staring up at him with a wide-eyed look of faint surprise.

The morning haze had burned away. Windows glistened in iridescent colors, staring down at Elliot like strange insectile eyes.

The sign on the shop says simply *Artisan*. It means jeweler, technician, craftsman, engineer: artificer. The artisan subcontracts for the University, hand-crafting microelectronic circuits for arcane research projects. In his spare time he grows gems in hand-blown glass bottles and crafts jewelery and trinkets for the few who can both appreciate and afford handmade ornaments. His shop is never busy, but he does not work cheaply.

The shop smells of orange and cinnamon. The artisan is a skinny, twisted old man, his eyes too large and too far apart, his fingers misshapen as if they had long ago been caught in a vise and smashed, mending *wrong*. It takes a moment to notice that he is not human at all. Then the wrong angles take on proper perspective; the subtle shadings on his skin are seen as a delicate patterning, not a hideous disease; his stature and shape seen as an almost fragile beauty. His voice was unexpected, soft and sensual, almost caressing the ears.

"My good Doctor Winthrop. How nice again to see you, how nice indeed. Have you work for me, some assignment to challenge these clever hands, or are you just browsing today?"

Winthrop paused, examining an exquisitely carved ballerina. Sculpted out of superconductor, she floated *en pointe*, the tips of her toes barely brushing the surface of what must be a magnet. With each puff of air, she twirled and bobbed. "I would have an assignment, if I thought your hands would take interest, but I now realize it could hardly challenge hands such as yours, so justly famous. I will not bother you with mentioning it."

"Ah, such a pity. I have been here hoping for some challenge for these hands. Surely, there is ever beauty to be created in even the most common crafting, but from time to time they long for something more, unusual."

"Of course. Such hands as yours deserve only the most difficult projects."

"Indeed. Alas, though, patrons who can appreciate such work are rare."

"Alas." He examined one of the gems, a rose crystal with tiny flecks of gold glittering inside. "This one is quite interesting. What is it?"

The artisan—Winthrop never knew his name, nor even if he had one—glanced up. "Yes, isn't it? It's a crystal of my own devising. A variation on chromium-doped aluminosilicate, with traces of manganese and beryllium. Do try the magnet, please."

Next to the jar sat a metal rod that he

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guessed to be the magnet. He waved it by the jar, and the gold flecks turned greenish, then deep blue, and seemed to sparkle and swirl. "Beautiful."

"This project of yours, what would it be?"

"Purely to satisfy your curiosity, I have been thinking of having a ring made to give my wife for our anniversary."

"To be sure, more than a ring merely?"

"To be sure. But it must be beautiful. Unique, ornate, cultured."

"A pity that your project will so lack interest, since these hands have been waiting for just exactly such a work. But tell me more about this work you will be having some other artisan to do. If you wish, perhaps I can give you some advice."

Winthrop smiled.

The ring was magnificent. As Anne put it on, it shrank to fit her finger. The jewel deepened from grey to a pale opalescent turquoise as it picked up heat from her hand. "Oh! It's marvelous!"

She is beautiful, beautiful; and it makes his heart break that she could lie with such an innocent, childlike smile.

Or perhaps his suspicions are baseless. When he sees her smile, Elliot believes anything she tells him. He cannot believe it, that she would be, could be, so true to him—to him!—and yet . . .

The doubt is tearing him apart. He has to know for sure.

2. *Afternoons of Dusky Jade*

She had been to all the right schools, and there was nothing there she wanted. Earnest young men of good families had sought her; she had only laughed. Football players had tried to mount her as another triumph they deserved for merely existing; she hardly even bothered to laugh. None of them had even tempted her. And then, an hour after she'd met Elliot, in a Harvard Square bookstore, she'd fallen. Later, they had both stopped to watch a street musician play saxophone while juggling, and she saw that they'd both bought the same book. She loved him for everything he was —cultured, poetic, smooth; and for everything he wasn't—rough, shallow, unsophisticated. He brought her roses and champagne; a dozen violets in blown-glass goblets; midnight gondola rides through the canals under the full moon. She treasured his lovemaking, his tenderness, imagination, attention. She loved the way his mustache tickles her, the pungent aroma of his pipe, which he always lit to draw no more than one or two puffs of, after dinner, his soft warm voice as he whispered poetry for her alone.

The corner store was just close enough to their Commonwealth Avenue townhouse to walk to, just far enough not to intrude its commerciality into their lives. It sold beans, milk, tomatoes, and cocaine hand-cultivated in Boston roof gardens, bootleg electronics and vid, biodesign dust-suckers, replica scrimshaw, alien geegaws and trinkets. Above the counter a hand-lettered sign said "appliances repaired." It smelled of spices and baked beans.

He was rough. His arms were strong and hairy. He wore an old style biocling shirt, the patterns faded and stained, inferior merchandise bought wholesale at

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some discount outlet. A name badge over the pocket labeled him "Rick."

The shop was full of calico kittens. The mother cat dozed patiently in a corner, while two kittens stalked and attacked Anne's ankles. She smiled and picked one up. "He's so cute. What's his name?"

"That little one's Sally McGiddykitty." He nudged the other one with a toe, which the kitten promptly attacked. "This one here's Martha." He paused. "Gotta have cats in a place like this, otherwise the rats would get too forward, you know?"

"Oh! You have *rats* here?"

"Lady, this is Boston, you know? There's rats everywhere."

Rich bitch, he thought, but then she smiled and he forgot everything else.

She wandered through the store, occasionally pausing to look at something, but not buying. At last she ordered half a pound of tea, a blend of chamomile and vargaspice that was one of the shop's specialites. He ground it for her, and she turned to leave.

He touched her arm, and she turned back to him questioningly. "Hey. What's your name?"

She paused. "Anne."

"Anne. You live around here?"

"Up the block."

"Do you know just how beautiful you are?" His words were hushed.

She laughed. "Thank you. I'm also married."

He shrugged helplessly. "I'm Rick."

"Oh." She dropped a bill on the counter and walked out. Her fingers were long and slender. On her right hand was a single ring, an elaborately carved braid of iridium, copper, and gold coiled around a faceted stone which speckled with crimson and azure that seemed to swirl and dance. He looked up just as the door shut. Her voice seemed to linger in the spice-scented air. "*Au revoir*, Rick."

Rick pays the gangs for the right to operate. They run tobacco out of his back dock. In turn, nobody else competes in his territory.

She was not drop-dead gorgeous, but rather had a beauty that showed in her poise, her self-confidence, the correctness of her dress, the slightest hint of Boston accent. She was so far above him that he could barely imagine her talking to him. He was captivated. While waiting on customers he would suddenly think of her and lose his train of thought, have to ask the customer again what they wanted. His heart pounded when she came in the door.

She is faithful, she *is* faithful. Winthrop's heart sings. She loves only me, I know it, the ring does not lie. How, how could I ever have been so lucky?

When next she went into the shop, Anne's gaze wandered everywhere, across the shelves, down at the floor, but never met Rick's eyes. As she left, he pressed something into her hands. She didn't look at it until she was well clear of the shop; then she glanced down and laughed. It was a water lily. He could not possibly have known that such a gift would be considered an insult in polite society. He'd meant well; in its own way, the gesture was rather sweet, and the flower was quite pretty. She

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held it a while as she walked, and then dropped it into a canal.

Rick caught her in the corner and held her wrists in one hand. Like a small animal in a trap, she was captivated. Her hair smelled like the first snowstorm of winter. The Brahmin, he thought, they can afford those exotic scents. He too was trapped, captured. He tried to say something, but suddenly realized that he knew no words to express what he felt. He started to kiss her, and she turned her head, so he kissed the side of her throat. He rested his cheek against hers. She softened for a moment, then broke free with a peculiar noise that was half a sigh, half a protest.

"That was uncalled for."

"I'm sorry." His eyes did not look sorry.

The colors in the ring swirled and danced. "I'm sorry too," she said. "But I'm faithful to my husband." The ring remained blue. "I'm not interested."

The blue of the ring swirled with pink.

He was out of line, way out of line, and Anne knew she had to put him back in his place with a few well-chosen words, but the words she needed would not come to mind.

Her head was fuzzy; her heart pounded. But what could she do? She knew that to avoid the nearby store altogether would excite Elliot's suspicions even more. Could she just tell him that she had had a passing infatuation with a store clerk, but it was nothing, she was faithful still? He would never believe it.

And she couldn't put off shopping forever. Already they were almost out of fresh tea. Surely if they ran out, Elliot would notice something?

3. *Evening in Chamomile and Crimson*

Rick pictured her face, and the ring flashed into his mind. The ring. It had to be biodesign crystal; nothing else would change with her moods so quickly. Alien, expensive. She was out of his class, he thought. Forget her. But didn't the high-caste get lonely, too?

The ring. Funny how his thoughts kept coming back to it. What did it react to? Blood pressure? Something more complicated?

What was it trying to tell him?

She walked with hesitation, looking every direction except toward the store. He ran to catch her, leaving the shop open behind him. She turned her back.

"Listen, I'm sorry." She was silent. "Really."

He stared at her back as she walked away.

It was a week later before he saw her again. He explained himself to her, hopeless, helpless.

"My mother was Brazilian. Is this a crime? If so, I am guilty, though you charge me with something I had no control over. She was very beautiful, my mother, that I can remember. She used to play maracas in the Samba band, at Carnival. She was tall, and stood with her back absolutely straight. She died when I was eight, in the riots.

"I never had a chance to go to col-

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lege. Is this a crime? I longed to go, but the expense; it was impossible. We barely scraped by; times were not good. We put together all the money we could borrow to send my younger sister Elise to college, to music school in New York. She left, and never returned. But I have no regrets. Of all of us, she had the talent, and deserved her chance. What did she have to return to?

"I aspire to greater things, to arts and literature and love that they say is above my station. Is this a crime? And I aspire to love you. No, I will tell the truth. I do love you. Is this a crime? If it is, I must plead guilty, guilty in the highest degree, and throw myself on your mercy."

When he finally caught up to her all his words deserted him.

She looked at him, though—so much better than her looking away!—but still silent. Approval? Disapproval? The ring was muddy, no help in fathoming her emotions. He sighed. "I'm sorry. I should apologize."

"Your apology accepted," she said, quickly. The ring speckled vermillion and blue. A half-truth, he thought. What does that mean?

The day was cold with the preparations for winter. She walked without thinking, and gave a tiny jerk when she looked up and saw where she was. She tried desperately to picture Elliot's face, remember his voice, his words. All she could see was Rick. She had to break free. With a huge effort, she stepped back and walked past the shop.

When next she entered the shop the canals were glazed over with the first ice of winter. Down the hill, people were out fixing ice-blades on their 'foils. The mood was gay and festive.

The shop was warm and cozy. Rick lifted her hand, admiring the ring. She avoided his eyes, but could not summon the strength to pull her hand away. "He gave you that ring?"

"Elliot. Yes. Isn't it beautiful?"

"And I bet he holds your hand, looks you deep into the eye, and asks if you're faithful to him."

"Surely that is no business of yours?"

"And then when you assure him that you are, he drops his eyes, ashamed to have ever doubted you, and stares at your ring."

"Why—how did you—"

"He doesn't trust you, Anne. Watch the ring. Now say something untrue. Come on, anything."

"I, I—" She laughed softly. "The moon is a huge ball made of bright blue cheese." The ring was a contemptuous red. She stared at it, her laughter fading. "No."

"It is."

"He wouldn't . . . he couldn't violate my trust like that."

"Tell me you don't find me interesting." She shook her head, tried to pull her hand free. But she didn't pull very hard.

"Come in back." She hesitated. "I won't hurt you. I just want to show you something." In the back room were appliances in various stages of repair, coffeemakers, vid cartridges, biochips opened up with gleaming crystals exposed, micromanipulators poised to the side. He put her hand on the image stage of a zoom viewer. An enlarged vid image floated in front of her, gaudy with the bright falsecolor of elemental iden-

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tification. He zoomed and focused, found a particular spot, zoomed in until it filled the air. "Here. Biosensors. Skin conductance, heart rate." Arcane patterns, thin-film circuitry revealed in green falsecolor glow against the gold. He rotated the ring, zoomed out. "There. Muscular microtremor sensor, synaptic firing pattern analyzer. Beautiful piece of workmanship. Made by an artist. But it's a lie detector, without doubt."

"Oh," she said. She pulled away her hand. How could Elliot have done this to her? He had violated their trust. Worse, he had given her over —unintentionally perhaps, but no less completely—to a stranger.

No, she thought. Not a stranger. She was lost, adrift. She didn't know how to feel.

"Tell me you don't find me interesting." He watched the ring. She said nothing.

"I'm not a poet. I know. I've never had the chance to be. I'm rough, uncultured, all the things you despise. I can't help the way I am, my love. Quote poetry to me, Lady Anne. I will listen to you. Teach me, sculpt me, make of me what you will. Am I the less for being rough? I am a diamond, for you alone to carve."

"I . . . I have to go. Someone is waiting for me. A, a girlfriend. We're meeting this afternoon to go shopping."

He held her hand and brought it up between their faces, turning the ring so they could both see it. "Say you are going to meet a girlfriend this afternoon. Say it."

She was silent.

"Just say that you aren't excited by the idea of letting me make love to you." She shook her head. "*Say* it."

"I don't want to go to bed with you," she gasped.

The ring blazed with the intensity of her lie.

He stroked her hand, slowly, gently. "My love."

"He will be suspicious."

"My love, he will be suspicious of you no matter what you do. He will be suspicious of you until his dying day."

"What will I say?"

He reached into a cup behind him, pulled out an ice cube, pressed it to her finger. She jerked back, startled, but he held her hand firm. In a moment the ring loosened. He pulled it off her finger, looked at it for a moment, then put it on his own finger. "I've loved you from the moment I first laid eyes on you," he said. "I will never hurt you, I will never lie to you, I will never try to make you into something you are not. I love you." The ring was a deep, magnificent azure.

She trembled. "What can I do? What could I tell Elliot?"

He smiled. "I know a jeweler. . . ."

With a scent of—musk? Chamomile? —her shift fell away. They made love in his apartment above the shop, in the clutter of kittens and houseplants. After the storm, a kitten hopped up on the bed and licked her nose. She giggled. The kitten held her down with both paws, and resolutely began to wash her face.

When she leaves it is already early night, and snow is gently falling. She is calm; for the moment at peace with herself, with the world, her passion

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stilled. The snow falls in large clusters, dyed garish colors in the lights of the city, the eddying winds blowing it upward as often as it falls down. In the distance children scream and shout as their sleds glide by, pushed by silent puffs of air across the snow-covered canals.

The new ring feels strange for a moment, then adjusts to her finger. She looks at it, marveling at how perfect a duplicate it is.

Perhaps someday she will have to make a choice. Perhaps one day Elliot's sleeping suspicions will again awake. But for now she walks calmly, peacefully in the eye of the storm.

She smiles, and walks slowly into the snowswept night. ■

IN TIMES TO COME

● Events on the astronomical scale, in general, proceed so slowly that to human eyes they may not look like events at all. A star, for example, spends most of its life in one or another of several phases, each of which looks very much like a steady state for far more than a human life. But the *transitions* between "steady states" tend to occur much faster, which can create pretty serious problems for people who happen to be nearby. Such is the case in our May issue's lead novelette, "Transit of Betelgeuse," with a suitably dramatic cover by David Hardy. Of course, as you might expect of a Chase novelette, there's a good deal more to these people's problems than the simple threat of a star with awkward timing—for they *are* people, and there are other people and other aspects of the star itself that they didn't expect when they came. . . .

Martyn J. Fogg's fact article, "Astrophysical Engineering and the Fate of the Earth," also deals with the problems of aging astronomical bodies. Even the Earth and Sun are not forever—but is there anything our very distant descendants might be able to *do* about the problem when their old home "wears out"?

The issue will also feature a variety of fiction, including a novella by Michael F. Flynn about what happened to Sarah Beaumont *after* she stumbled onto the history-shaping machinations of the Babbage Society, and stories by Jerry Oltion and Julia Ecklar.

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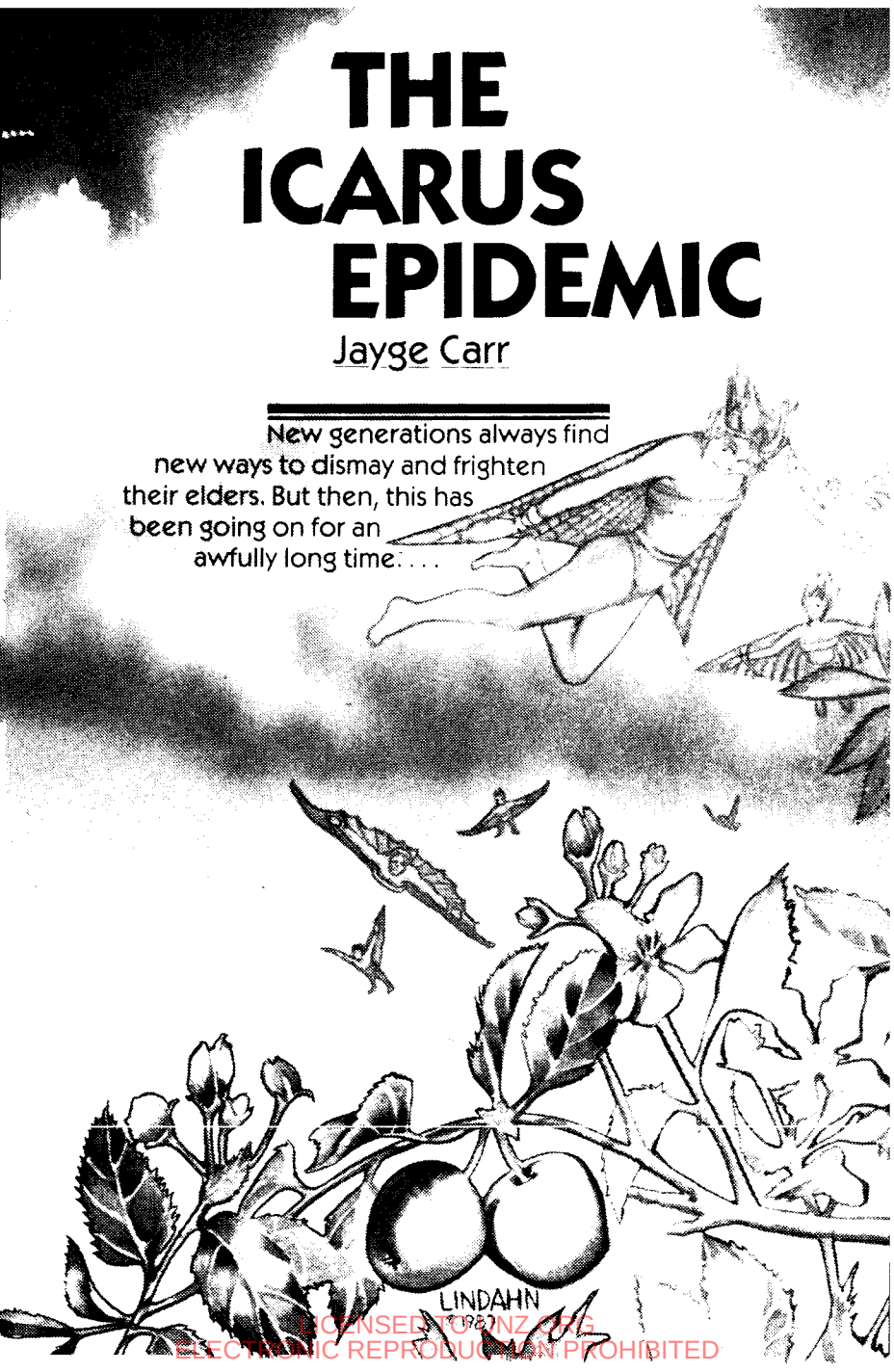
THE ICARUS EPIDEMIC

Jayge Carr

New generations always find new ways to dismay and frighten their elders. But then, this has been going on for an awfully long time. . . .



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The wind was soft. Bright rainbowed pinions sparkled, fluttering like scraps of confetti in the white-freckled blue. Jewels in the sun, sapphire, ruby, amethyst, emerald. Peacock glory, fairy grace, dipped and twirled and pirouetted, an ever-changing but always delightful ballet in the sky.

Zoe, coming up to the flock from leeward, played her usual game. Setting the tiny flying lab to hover, she scanned the flock and made an estimate. "Three hundred," she said firmly. Then, to confirm, "Q: How many individual subjects within 2,000 meter radius?"

"Two seventy-two," stated Nostradamus—Noss—the computer, in its recently reprogrammed resonant brown-velvet male voice.

"Not bad," she said with a little satisfied nod. Close enough. "O: Record. Include date, time, weather."

"A."

Zoe took a 360° turn in her chair, scanning the sky through the wrap-around plexi. No other flocks in sight. To check she asked, "Q: Any other flocks within range?"

"Yes, one about fifty klicks, one at fringe."

"Q: Size of flocks?"

"Nearer flock 127, farther rough magnitude seven hundred, too far to distinguish with accuracy."

Zoe's brows—high-arched and harlequin checked in passion pink and black—went up. The second flock must be barely within range, if Noss couldn't give an accurate reading. The size was high, too. High enough to be worth a check, after she got through with this one, but not so totally abnormal that she'd pass by her birds-in-the-hand—she giggled aloud at the mental pun, although she made it an average of twice a day—to check them out. "O," she said aloud, "Keep the larger group on scan, let me know immediately if they drift completely off instruments."

"A," Noss-the-computer acknowledged.

Zoe rubbed her little finger along her lower lip thoughtfully. Was there anything else she needed to do before going out to make the actual survey? She shrugged. If there was, too bad.

"R," she said briskly, "I'm going out for my survey. O: Lock up tight until I return, continue all programs as ordered, and start anything as scheduled on time without my input."

"A."

"O: New sub-routine. Whenever I leave the craft, you are not to say A, you are to say, 'Good-bye, Zoe honey. I'll miss you.' "

"A."

"O: Say the new sub-routine for when I leave once now for practice."

"A. Good-bye, Zoe honey. I'll miss you."

"O: On the new sub-routine for when I leave, lower the volume 15 percent, and increase the bass—let's see—10 percent."

"A," said Noss agreeably.

"Try it again."

Noss, not having been given the proper cue, said nothing.

Zoe ground her teeth, alternately pink and black to match her brows. "O: Say the new sub-routine for when I leave again."

"A. Good-bye, Zoe honey. I'll miss

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you." With the decrease in volume and the increase in bass, the voice was now caressingly seductive.

"Good. R: I'm leaving now."

"Good-bye, Zoe honey. I'll miss you."

Zoe grinned as she rose gracefully and, adjusting her goggles with the ease of long use, took the two steps to the air-lock. She slid the little panel aside, and bent forward slightly to insert her arms into the harness. The first buckle went under her armpits but over her breasts, the second at her waist. She bent over to fall the rest of the way into the harness, and reached behind herself to get the third strap, which had to be pulled down her back, between her legs and up to connect with the lower body strap. It was an awkward maneuver, getting into a wing harness from a vehicle, but she had done it countless times before, and it took only seconds.

"Banzai!" she caroled, with that rush of before-flying fervor. Freedom and joy and pure pleasure flashed through her, giving even the plain chrome panel in front of her gaze a rosy glow. "Tally-ho-ooooo!"

Noss, obeying the sub-routine she had programmed into him, opened the outside airlock door, and, simultaneously, the larger panel between the living compartment and the lock. In effect, a hole appeared in the side of the ship, and she dove out and down, a neat swan dive, her pinions spreading in obedience to the remotes on her wrists to cup air.

"Ahhh!" She did a triple twist for the sheer pleasure of it, felt the orgasmic surge that was flying, in air sweeter than wine and softer than a lover's caress. Like the best of scubaing, and skydiving, and making love, then multiplied manyfold; total freedom, infinite delight, a sweet continuous high. For a tiny breath of time, she felt the ever-strong urge to give in, to enjoy, to throw off reality and responsibilities and let herself have this natural exhilaration undiluted with mundanity.

Ahhh*hhhhhh!* Just this once. Just this—

She shuddered, as practical mind fought lizard-brain emotion, then straightened out to begin a gentle glide down toward the flock. (She had learned the hard way never, never to approach a flock from below. *Birdie, birdie, in the sky*—)

She had her survey routine worked out, all she had to remember was which day of her four-day work week it was, to know whether to start at the fringe and work in, or maneuver toward the center and come out.

It was Two, so she arched over and approached the middle of the flock, automatically joining the moves as she got closer.

This flock was truly talented. She admired their beauty and grace, as she fitted herself into the pattern.

For about five minutes she simply moved, enjoying the freedom, the sun on her skin, the ever-changing display. (Non-flying friends had often asked her if she ever got tired of it. She only laughed.) Perhaps this would be the one day she could simply fly, not worry about—

"Applause, lady, you move sweet," said a young voice, nearby.

Zoe twisted slightly to face the speaker. *R: First subject, nude, male, green,* she sub-vocalized, knowing the tiny re-

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ceiver on her throat would pick it all up, and record everything said by her or the subject for later analysis.

The other facts would determine the rest of her interviews. After she finished with him, she would look for a female, nude, blue. Then a male, jockstrap (few flyers wore more than a jockstrap or 'kini) violet, then a female, 'kini or g-string, red. She always skipped indigo; in the first place, it was an uncommon color, in the second, too close to both blue and violet. Otherwise, she worked through the spectrum, using the main or background color of each pair of wings, switched sex with each interview, and switched nudity or not after each pair. (She had discovered definite differences in outlook in re clothed or unclothed.) It gave her a spread, and using a randomly chosen first subject helped keep her own possible biases from skewing the results. (Not that she thought that it might, but who knew. Color, like modesty or lack thereof, was an indication of personality, after all.)

"Bravo," she answered in the current slang, "you soar mighty."

"Hey!" He grinned, his wings, bravura emerald background with the faces of the current top acro-fly teams scattered like giant freckles, haloing his young and matching-emerald painted face. "For an ol' chick, you click."

"Ding dong, tagalong." She grinned back, amused at the description. The flyers considered anyone over legal majority age of twenty-one old. "Confusion say, you as young as you feel, and I left all my worries on good ol' conforma terra."

He had moved up, they were gliding side by side. He did a sudden roll, swooped under her, and came back up the other side. Then, grin widening, he did a slow stretch, displaying himself.

Zoe hid a frown. He had it all to display; Michelangelo would have gloated, and recarved David. But she made it a policy never to mix business with pleasure. If she didn't respond . . .

He put it into words. "For an ol' lady, you sleek. Wanna play?"

She thumped him playfully in the ribs with her toes. Flyers habitually used their feet instead of hands, when the wrists held the pinion-slaves, the palms the finger-touch controls. "Sun's hot, I'm not. Ol' man wore it out earlier. 'Nother time, bravo?"

He shrugged without moving his wrists. "Plenny of feather in the air. Not come to play, why here, lady? You no flyer."

They always knew. "But I love to fly." She spoke with complete truth. "I fly every chance I get."

"Lady, sweet ol' lady," he chided, doing a little body twist, so he faced her completely, "you don't love it, or you wouldn't leave it." He did a jack-knife, and a roll and twist that would have put him above and slightly in front of her—except that she expertly followed his maneuver, ending up again side by side.

"I don't shower you, why you shower me?" she asked, with a mischievous wink.

"Lady—" She had regained with her expertise what she had lost with his anger at one who claimed to love it but didn't live it. "Lady, triple sweet. True lightning."

"Dance?" It was her turn to try an invitation.

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"You don't know our flock's go," he objected.

Zoe couldn't resist. "I'll wing it."

During the dance, she managed to brush up against him several times, and the tiny skin-camouflaged analyzer across her left knuckles picked up enough stray skin cells to identify him when she did her report.

All the while, she keep on chatting, recording each stray bit of data that seemed interesting. He called himself Ariel, at least for the moment, one of the common names flyers chose, along with The Red Baron, Jimmy Doolittle, Sally Ride, Tinkerbelle, etc. He had been flying for six years, which made him one of the earliest aficionados.

Ariel, like many of the long-termers, had a water condenser, for drinking or reconstituting his supply of dried rations. It ran off the same solar power system that powered his wings when they weren't in glide, with its storage battery for dark or overcast. Plus the newest flyer-gadget, an auto-frame, which made it (reasonably) safe to sleep in the air, the frame supporting the torso and keeping the wings in position and the body horizontal, and emitting a warning if any other object came close, or if the flyer drifted too near the ground.

Zoe asked the current Vital Question. "How long since you've grounded?"

Ariel shrugged his flyer's shrug again. "Who keeps track? Weeks, I guess."

Zoe executed an expert entrechat, allowing her lower body to curve downward, her legs to execute the ballet movements.

"Too sweet," Ariel approved.

"This is a day flock, isn't it?" Zoe panted. She was getting a little old for this!

Ariel decided it was time for him to strut his stuff, which he did with such verve that they gathered a small audience, mostly female.

But before he could take his choice of the onlookers, Zoe managed to get a few more bits of data from him: this was a day flight, but he switched every so often, and he hadn't grounded for a while because there was nothing to go to ground for, the condenser and rations provided his water and food, he could sleep on his frame, and he traded for tapes whenever he wanted to jive out.

One of Ariel's rejects was a female, nude, with wings of lapis lazuli blotched with cat's eyes of crimson, orange, and purple. Zoe flinched at the visual cacophony, and sluffed her as soon as she could, with a sub-vocal note not to use her testimony unless it jibed with the rest, because—intuition—she was capable of malicious lying. Worse, of malicious inconsistent lying.

The next male was an OK subject, but hard to draw data from, but the female after him—she called herself Misanthrope, but judging from what she was doing as Zoe approached, it was sarcastic—was a gem, answering easily and lightly, even offering data.

"Most of you flyers seem to dislike authority," Zoe said provocatively.

"Oh, it's sky clear you play steady with The Man." Misanthrope had one of the harnesses that you could flip in; with an easy move, she turned in it, so she was gliding face up. "And I know how a lotta the wings feel 'bout a squeal. But why. I mean, wings don't fall fair

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outta the air, grounders make, we take. We should say thanks, not shower."

Zoe had a strong honest streak. "I don't have anything to do with making wings," she said, almost apologetically, instinctively not using flyer's argot.

"No?" Misanthrope could have been lying in bed, she was so relaxed, instead of flying. "But you do something—ah, useful, right?"

"I think so," Zoe said dryly.

"If you didn't, 'nother mud shuffler have to; right?"

"Probably."

"Well, then." Misanthrope made a lanquid flyer's shrug. "There 'tis. You do a must-have, somebody else doesn't. Who knows, maybe that somebody needed to make wings. So 'cause of you, we have wings, soar more." She turned her head, flashed a green-teethed grin. "Right?"

Zoe thought it over for less than a second. "Right."

Misanthrope locked her wings on autoglide, folded her hands together under her neck. "Somebody stuck with dirty work, right?" A wink. "Just glad ain't me."

"You might—" Twice now one of the flyers had come close to probing her own dilemma. "—find you like your work, too."

"Better than this?" Misanthrope went into a deliberate spill, her laughter trailing behind her. When she had finished the maneuver, she waited for Zoe to catch up.

"Not better, just different." Zoe herself had been in her early twenties when personal flying with wings (thanks to several discoveries, culminating in the breakthrough of Morgenstern's ultra-efficient solar power cells) became possible, her late twenties as it became popular. She hadn't grown up with it as these kids had, couldn't know the dependence or fanaticism or whatever they developed.

"No way."

Zoe decided to try a little experiment. "Suppose you'd never flown. There would be something else in your life you liked to do best—" Conscious imitation: "—right?"

Dubious, painted face frowning. "Maybe."

"You might think you'd never like to do anything better. But suppose flying came along *then*—"

"Shower!" Misanthrope, with no hesitation or show of modesty, proceeded to pull her bikini bottom down and do just that.

But while she was interviewing another subject later, Zoe noticed (and made a sub-vocal note of it) that Misanthrope was in the middle of a small cluster, discussing *something* vehemently.

When Zoe got back inside the lab, she carefully removed her wings and checked them over thoroughly before hanging them back in the air lock in the proper position for her next exit. Then she relaxed, and noticed a blinking red light that said somebody wanted to talk to her toot sweet. Under it LEDs spelled out the origin, Federal Department of—Zoe quit reading, pursed her lips and shrugged. There was a couple of other things she intended to take care of first. She hadn't the kids' lack of inhibition about relieving herself in public—to say

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nothing of their other public actions! —and that need was great. A quick air-scour, and a little food—

When she finally told Nostradamus to acknowledge, she was clean and comfortable in a fresh 'kini, a glass of brewed coffee in one hand, a crisp apple in the other.

"About time," a voice muttered, as a holo image wavered and firmed.

Zoe shrugged. She had checked with Noss if the call had included a university code and it hadn't. So whoever it was—

The holo showed a person sitting behind a desk, gray white steel-wool hair in a style Zoe had to search in history to identify as a Mohawk, shrewd clear bright eyes set in brown wrinkles. . . .

"About time, Dr. Fidelio," the caller rasped, voice hard, before taking a drag on a long black cigarette. Yet the curves under the bureaucrat gray flannel were female, and the long dangling beaded earrings were in the shape of Venus's sign, not Mars.

Zoe raised her eyebrows, and saluted the unknown with her cup of coffee. "I was out. Working."

The bureaucrat took another drag on the cigarette and let out a long plume of blue smoke before glancing down at her desk—console?—top. "You've been in precisely thirty-four minutes. I was signaling emergency."

Zoe's eyebrows went higher. The bureau was right. She could only be right if she'd gotten an acknowledgment from Noss as soon as Zoe boarded; and she could only have done *that* if she'd gotten a special password for Noss from the 'versity.

"Yes. This is official." Glare from fierce eyes hazed by another stream of smoke from the thin nostrils. "My official; and yours. I'm well aware that you ivory tower types care for nothing but your towers. Well, your Professor Hathaway knows where her funds come from, so—"

"All right," Zoe acknowledged with a shrug, taking a generous bite from her apple, relishing the tangy taste and sweet juice. Hathaway had gotten a sex-change from policy not conviction, and Zoe considered that said it all. So Zoe was merely biding her time until Hathaway, a bureau pretending to be a scientist, either moved on, or she herself could. "What do you want?"

"I'll forgive you the thirty-four minutes, young lady. I will not forgive insolence. This is too important."

Zoe didn't bother to hide her yawn behind her hand. She knew bureaus.

"Young lady—" With ominous patience: "My name is Dubonnet." She pronounced it "dubonney," then spelled it carefully. "I am not one of your garden variety paper shufflers. When I say important, it is. Now, will you cooperate to the best of your ability, or do you prefer to be filling out your unemployment forms by no later than tonight?"

Zoe took another sip of coffee, propped her legs up on the desk-table in the center of the small room, and yawned again. "I have tenure, Ms. Dubonnet," she informed.

"Dr. Fidelio—" A truly awesome Awful-smile, then she took another drag on her cigarette and produced an almost perfect ring before continuing. "—I am well aware of that fact. Believe me, any contract can be broken. If it comes to

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a choice between you and half the 'versity's budget—''

Zoe straightened up, debated for one microsecond taking the coward's way out of her dilemma—her wings were her personal property, after all—then put her coffee cup and apple down, and stared at the woman apparently seated across the table from her. ''What do you want?'' she said carefully.

''Good woman.'' The unknown nodded, snubbed her cigarette, and picked up another, but did not ignite it. ''Potential. You may find yourself in my chair eventually, if you don't blow your career first. For now—'' She leaned forward. ''I want some information.''

Zoe frowned. ''My papers—''

''Yes, you're the expert. But I don't want to plow through that jargonese you scholars—'' Zoe choked; for a bureau to be talking about a scholar's jargon. The woman acknowledged the irony with a crisp nod, ''—employ. I don't want that. I want facts. Insights. For now, I want your brain and everything in it. I want—''

''If there's anything in my papers you want explained,'' Zoe said crisply, ''just ask.''

Ms. Dubonnet leaned back, lips spread in a thin smile. She put the new cigarette in her mouth, took the deep breath that triggered the auto-ignite, and savored her first drag, before blowing smoke out slowly and continuing. ''Your jargon isn't that unique, Dr. Fidelio. If all I want is interpretations of public papers, I can have them with the snap of my fingers.''

Some things are too deeply ingrained. ''Do you truly want half-baked educated guesses?''

The bureau sighed and leaned back. ''I thought you were more intelligent than that. I'm well aware of publish or perish, and I have no intent of jeopardizing your career by spilling either your data or your hypotheses. I said I wanted your expertise, and I meant it. Use that brain of yours. Stop and think, don't just draw academic conclusions, draw human ones.''

Zoe tried to conceal her glare —unsuccessfully.

''One—'' The older woman held up a finger. ''The numbers of flyers is increasing.''

''You don't need me to tell you that,'' Zoe snapped.

''Two—'' Two fingers, the cigarette between them sending up a languid curl of smoke. ''The rate of increase is itself increasing.''

Zoe sat up. ''How did you know—''

''Hathaway—'' Voice and expression said that the woman had the same opinion of Professor Hathaway as Zoe did. ''—knows who she wants to owe her favors. She saw the political implications in your preliminary studies and contacted my unit. The underling of mine she got in touch with had the common sense to push the panic button on my desk. So, then, three—'' A third finger came up. ''The average age of the flock is slowly decreasing.''

''And four,'' Zoe concluded, ''the average age of first wings is also slowly decreasing.''

''Are you still wondering why someone might become concerned over the phenomenon?''

''You missed number five. The amount of time spent in a flock is increasing, and the number of total flyers,

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the ones who don't come down for days if not weeks at a time, is increasing."

"Damn!" Without thinking, she snubbed her cigarette and reached for another.

"I see the problem, only too clearly. But what makes you think I have the answers?"

"You don't think, with a problem of this magnitude, I'd depend on a single source, do you? That's for the rut-thinkers. I'm not one. The evidence is, you may not be, either."

"Thanks." It was a snarl.

"Dr. Fidelio, I have more problems to contend with than you could possibly imagine. I am asking—"

"Asking!"

A shrug. "Would you object less if I worked through Hathaway?"

Wry smile, and honesty. "Probably more. Hathaway knows she'd better not shower in my work, or else."

"For now, all I'm asking is an oral précis of the current situation, as you see it, and the most probable future development. Then, also, for you to be thinking about the problem, as you continue your normal work." She smiled suddenly, and Zoe realized one of the reasons she had a position of power. Old, she might be, ugly with her old-fashioned style, she might be, but intelligent she almost had to be, and charm she had, when she wanted to employ it, in gobs.

Zoe sat forward, hands dangling between her knees, and said bluntly, "The problem, as you call it, is getting worse. It may stabilize in the future, or it may not."

"Your best educated guess?"

Zoe made a helpless gesture. "Have you ever flown?"

"Only in a plane."

"Then I can't explain. Flying is —is—the ultimate human experience. Sex, drugs, whatever, can approach it in their peaks, but flying sustains the—the *high*. The sheer adrenaline-rush joyous—" She searched for a word. "—*experience*. It lasts. It becomes as psychically addictive as some drugs are physically addictive."

"It's killing our future. It's stealing our children."

Zoe shrugged. "They've said that about every bit of progress from the cross-bow to the computer. Yet humanity has survived."

"You find it difficult to stop," Dubonnet the bureau said shrewdly.

"But I do stop." A pointed glance at the cigarette. "Do you?"

"Oh." A wry smile, unfairly loaded with charm. "Just habit." She waved the cigarette. "I can stop any time I want to."

"I stop every day," Zoe said softly.

The bureau nodded. "You've made me understand. Thank you, Dr. Fidelio."

"Thank me if I manage to come up with something."

"You aren't our only chance, just the most likely."

"Thanks," Zoe said glumly.

Zoe half rose from her seat, fists clenched, mouth drawn back in a snarl. "I knew it," she hissed at her companion, a fellow professor, also slowly rising to his feet. "You've just been using me!"

"I made you—" he bit out between his teeth, every inch, except for the

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swarthiness of his skin and the liquid blackness of his almond eyes, the offended English aristocrat. Which was ironic, because he was a mix of Russian, Pakistani and Arab. "—an honorable offer of marriage."

"Did you?" she asked softly, fists pressing against the carved smoothness of the wooden table. She had invited him to dinner in her own home, and they had been in her favorite eating spot, a wooden table set out in the garden, trees around them, and the lattice roof over their heads—she liked to see the sky in the day, the stars at night —camouflaged by dangling wisteria and clematis.

He accepted the challenge. "An honorable offer of marriage," Ivan Habib Bhagratti repeated firmly.

"*Full* marriage?" Her nails were drawing blood.

He was Muslim. "There is no other kind."

Softly: "Children?"

"As many as Allah allows."

"*Damn* you!"

"I don't understand." He was honestly puzzled.

She turned, let out a shuddering sigh, and leaned against a sugar maple, its sun-warmed bark somehow comforting. "I guess you don't at that," she said, sighing. "But I don't play brood mare, Ivan, for you or any man."

"Zoe—" His voice was gentle. "If that's all I wanted, surrogate mothers are easy enough to buy."

"Surrogate brood mares, you mean." She wondered how many of the children in the flocks had bought their wings that way. "But real mothering—"

"—is as rare as real fathering. Yes, I want children, and I am not hypocritical enough to deny it. But I would give, not just take. I—what is really the matter, Zoe, tell me, please. I had thought—this past year—don't you feel for me as I had—hoped?"

It had all jelled when he had asked his carefully casual question. Now she could answer him honestly. "I don't want children, Ivan."

"That's absurd," he said before he could censor himself. "You love children—why else choose a life work in constant contact with them?"

"It's because I do have so much contact with them that I know. I couldn't bear it, Ivan. To see a child I love, my child, become a flyer or whatever the equivalent is fifteen or twenty years from now—I just couldn't."

"Children have always been hostages to fate," he said tritely.

"But at least before there was an honest chance." She shook her head. "Even I can barely resist flying's insidious attraction. A child—"

He caught her hands. "Our children—"

She pulled away. "Don't you think all the other parents think that?" Then, simply: "No."

"I see. If I promise not to do anything to try to influence your decision, may I hope you will change your mind?"

A long white clematis draped in her hair, as though it were a planned part of her costume. "I won't." Her lip twisted. "Woman's lib in its truest form: no woman has to have a child unless she wants to."

"I know." He was a sociologist, too, well aware of the effect that true birth

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control and woman's lib had had on the battle of the sexes. "I'll wait."

"If you truly want children, Ivan—look elsewhere."

"Until then–" He brushed aside the clematis, and drew her back to the table. "—I'm still hungry."

"Men," she muttered, but sat down and asked a question about the power struggle going on in another department to get the conversation back on an easy basis.

Three flocks in a row were oddly small. Zoe wasn't sure why, until she realized that the storm clouds which had been merely threatening this morning, were getting blacker and blacker.

"I like to fly in the rain," said her current subject, a mesomorphic male a little older than most, his wings oversized to support his own largeness.

"Warm rain," Zoe agreed. "It's a little like swimming."

He gave her the look she had long since learned to recognize, the look of one who is In, for one who is not. "Cold is gold, ol' lady."

She frowned. "You don't fly when there's lightning, do you?"

"Prickle is part of the tickle."

"It won't be just a prickle if you get hit," she pointed out.

"Odds against. But if the skein ends—" He did a neat somersault. "—wantta go in the air."

It was getting darker and darker. Suddenly she squinted. The front of the flock was going through maneuvers she hadn't seen before. "What's going on?" she asked.

"Flock leader found a field to land on, in exchange for some chore or other. Last one was dusting crops. Nasty. Hadda wear protec suits. But those who wantta go, will. The rest'll loop around, pick 'em up after the storm."

"Do a lot of the flocks sit out storms?"

"Yeah. Play-skyguys. Not real flyers."

Most of the flyers lived in the sunbelt, for obvious reasons. Suppose—

"If it stormed more, do you think most of the flocks would fly less?"

He gave her the Look again. "Lose a lotta the playguys. Not the real ones."

She sighed. It had been a thought. But it would simply divide the flyers into two distinct groups, the total fanatics, and the more casual flyers.

Nonetheless, it was a thought. . . .

"Weather control?" Ms. Dubonnet the bureau frowned. "I don't know, but I can find out. Reasonably accurate, I would imagine. What have you in mind?"

"A stopgap." Zoe stretched, and scratched under her right heel. She was relaxing in her garden, making her report and being lazy before getting dressed and meeting Ivan for the Drama Department's *Twelfth Night*. She scratched again, irritated. Time she had the garden sprayed again.

"Rain? If that was all it took—"

"No, a lot of them like rain. But would they equally like—hail? Nasty cold little pellets that fall and melt—"

"Wouldn't it be dangerous to the wings?" Dubonnet asked with a frown.

"That's why I asked about accuracy. Big hail would be. Tiny hail, no. Not with all the wing's built-in fail-safes."

Ms. Dubonnet smiled slowly, nastily,

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the inevitable cigarette sending a smoke signal up. "That should ground the little devils, once and for all."

"No, I said a stopgap, and I meant it. It will ground a few, discourage a few; but the only real long-term effect will be more and smaller flocks. Locating and dumping hail on a flock will be the same cost and difficulty no matter how large or small it is. They'll just keep separating, until the flocks are too small to bother with."

Ms. Dubonnet ground out her cigarette and picked up another. "Then what's the point?"

"Buy time."

Ms. Dubonnet nodded decisively. "I'll take care of it."

"Just make sure that whatever flock I'm with doesn't get hit any more or less often than any other."

Ms. Dubonnet's eyebrows went up and her head tilted inquiringly. Her big feather earrings—peace signs today—wavered and dipped like tiny flyers. "Aren't you overestimating them? I'd assume you'd want us to avoid whatever flock you're with completely."

"Shower, no! Don't underestimate them. Do as I say. Just be sure I'm not with the first two or three hit. I don't want them jumping to the right conclusions."

A decisive nod. "Consider it done." Then, the harried bureau: "If there's anything else?"

"No—wait. Yes. Could I ask you a personal question?"

The thick, still dark brows went up. "You can ask. I may not answer."

"Do you have children, grandchildren, of your own?"

"No." She ignited another cigarette. "Why do you ask?"

Zoe felt a little embarrassed. "You seem to have made a personal crusade out of this. I just wondered—"

"If I'd lost one of mine to this madness. No. But—" A spread of the hands. "They're all my children."

"I see." She hadn't learned to like Ms. Dubonnet and her steamroller tactics any more, but she had to admire that attitude. She chewed her lip.

"Drop the other boot," the bureau encouraged.

"Why no children?"

The older woman pursed her lips. "I suppose I owe you one, for your suggestion. But why do you want to know?"

"I—have a personal decision to make. I'd like to know . . . why you decided the way you did."

"Oh." A woman-to-woman grin. "Men. Can't live with 'em, and can't live without 'em. He holding out for kids and you not so sure you want 'em."

Zoe waggled her fingers, a *comme çi comme ça* gesture. "In a way. He wants marriage, real marriage. He's willing to let things ride for now, but—"

"What do you have against kids?

"And have them wind up—" She nodded skywards.

"That's a risk parents have always taken. Plague, wars, natural disasters—" She lit another cigarette, and without taking a pull, snubbed it. "I'll tell you about my decision, for what it's worth. I lost the choice."

"Lost—"

A nod. "When I could have had 'em, I felt I was too young, wanted to grow up, have my fling, whatever. Only I got

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an infection, one of those things that was going around back then, and it scarred me internally. I was sterile. Oh, they came up with a corrective operation eventually, but by then, I was too old. I would've liked to have had kids, but some opportunities you can never go back and pick up." She frowned, inputted something on the console on her desk, and looked up again. "So my reasons can't help you, because in essence, I lost the chance."

Zoe got caught in her first hailstorm a little over two weeks later, and it was as hideous an experience as she had expected. Worse.

It had blown up almost without warning, from a sky that had been barely overcast. Within minutes it went from gray to black, and the wind whistled and howled, tossing the flyers about like Dorothy's house in the tornado.

Zoe could have retreated to her lab, but she decided to stick with the flock, see how they coped with the storm.

Not well. There was a nervousness among the flyers, and they dropped all their casualness and playfulness in favor of some fast battery-draining flying in an attempt to get in front of the gathering bad weather.

The hail itself came out of nowhere, nasty little stinging pellets, cold and hurtful.

The flock hesitated, then some of the members started diving, evidently with the idea of grounding and finding shelter, and the rest followed.

"This is dreadful," Zoe shouted over the wind to her current subject. "What will we do?"

"I don't know," he wailed. "I'm frightened!" He was one of the youngest of the flock; he claimed thirteen, but Zoe was sure analysis and ID would put him at twelve or even eleven.

"Try getting under your wings—" But she was doing that herself, and it wasn't much protection. The hail was driving down at an angle—

"Owwwwwww! Help me!"

"Dive!" It was all any of them could do. The hail was all around them, stinging, blinding, almost choking.

Zoe suddenly collided with another flock member in mid-air, something she could never remember doing, thanks to computer safety controls, and they both spilled and went down in a screaming dive. Zoe recovered herself, and looked for the other collider, but the confusion was too great. Even over the wind, she could hear the screams. She tried to think instead of reacting instinctively, and was able, with the help of the safety autos, to turn the dive into a steep but controlled one. She couldn't see the altimeter on her wrist in the darkness, but suddenly the slave in her ear was barking, *Warning, six hundred feet . . . six hundred feet . . . five-ninety feet . . . five-ninety feet . . .*

She straightened out and tried to see where she was. Not that there was anything to be seen. She knew that her lab had to be close, it would have automatically descended as she had—

A pair of arms grabbed her waist, and a tinny voice wailed, "I'm scared! Hellllp me!"

She grabbed for hair, got a handful and jerked. "Listen to me," she screamed over the wind and the wails, "We've got to land, and we'll crash if we interfere with each other's wings—"

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"Hellllp—" She couldn't see much but the hair and frantically beating wings, their force thrusting against her and her own wings, throwing her about, disorienting her.

"Stop that!" She gave the hair a shake. "Set your wings to autohover—"

"I'm afraaaaaiddddddd—"

You'll be dead if you don't— All she could see was motion, but she pulled on her hold, forcing his—she could feel that much, of the slim frightened body thrashing against her—face against her body, positioning the vulnerable nape.

Thwack! She couldn't hear it, but the force of the blow sent pain and shock-waves all the way up her arm. He went limp, but she had his hair, and she held on, drawing him into position— They were tumbling, she wasn't sure how fast they were falling, because the slave in her ear was too far behind— She pulled him up, got an arm clamped around his thin chest, fumbled with his master-controls with the other hand—

She gave a gasp of relief as his wings infolded, now at least if she could—

RED—one hundred—RED—eighty—RED—

The wind was driving downward, she tried to angle her body horizontal, to make a parachute out of it—she had put her own wings to horizontal and full speed, now she could only hope they could fight the wind and the dive and—

CRASH!

It was the pain that made Zoe realize she wasn't dead, after all.

Slowly she oriented herself. She was hanging upside down in something. Small daggers were sticking into her everywhere. A warm smooth hardness was crushing her hand against a cold rough hardness. She could hear hail slamming against something, little spat-spat-spats, but it wasn't punishing her any more . . . or at least not by comparison.

She drew a deep breath, and one of the daggers was inside her, and it thrust, and crimson pain washed over her and she blacked out again.

It must only have been a couple of seconds though, because when she blinked and was aware again, the ghosts of the pain were still there.

She shifted her head, and whatever was holding her bounced. "Oh, my God!" she moaned. She never ate before flying, but her stomach didn't care; she heaved what little was in it.

"Oooaaaaww—" It sounded like a kitten's pathetic mew, and if it hadn't been so close, she wouldn't have heard it over the storm's roar, and the rattling of . . . branches.

That was it. Branches. She was in a tree.

Like Dumbo in the Disney film classic, she had awakened in a tree.

"Ooehhhhhhhh—" The kitten mewed again, and the weight on her hand shifted again, pinching her fingers cruelly.

"Apollo!" She remembered what name her subject had chosen, and said it, realizing what—or, rather, who—she was sharing her tree with.

"I want my daddy!"

"Apollo, listen to me—" It was ironic. They had dived several thousand feet; but if they fell getting themselves out of this tree . . .

"My name is Jamie! I want my daddy!"

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At least it was getting lighter, the storm must be moving on. "Jamie—" She tried to make her voice both coaxing and firm. "Jamie, we're in a tree. We're going to have to get down carefully, or we'll fall—"

"Fall?" He giggled. "I like to fall."

"You won't like it here," she said firmly. "Now listen to me. I can't see the ground, I don't know how high up you are—"

"Ground." He shifted, and the tree branches protested. "I don't want to ground, I'm a flyer."

"Listen!" It was getting lighter, she could see his face vaguely through a mask of leaves and branches. "I inboarded your wings when we dived, so if you're careful—" She tried to move and couldn't. "—you can get me free of the branches and we can both get down."

"Down? I want to go up!" Hysterical: "I'm a flyer!"

"You can't take off in trees," she tried to say calmly. "First we get ourselves out of this tree, then we look for a clear space to take off from." If she could take off. Apollo's wings had been inboarded when they hit the tree, hers had not. The wings were made of triphase composites and synthetic, but even the strongest synthetic had its tearing point. Even if her struts were all right, the sails probably weren't.

High and frightened: "I wanna fly!"

"We will, we will. Listen. I'm going to unharness, and then we'll try to get my wings out, they're caught on something. Then we'll both get out of this tree, find a cleared space, and take off. You can carry double, can't you? We'll fly, Jamie, but first—"

"*My name is Apollo!*"

It seemed to take forever, coaxing, cajoling, ordering, but eventually, she was out of the harness, and they had pushed and shoved the wings up and out, until they seemed free, and then she inched along a branch until she feared it would break under her weight, and shoved the wings even farther and gave them a good kick. She hoped they would fall all the way. It was as much as she could do, her ribs stabbed her with every movement, every unwise breath.

"Another one! *Get DOWN!*" The voice came up with the crashing of the wings. It was male and angry.

"We're trying to. Did my wings make it down?"

There was a loud cracking noise. "Yes," the voice said, with ghoulish satisfaction.

"Are they—" Another cracking sound and a satisfied laugh. "My wings—"

"Get down now, you worthless little cow-plop, or I'll pepper your hide with rock-salt."

He didn't sound like he could be reasoned with, but Zoe tried. "My ribs are broken. I'm coming as fast as I can." Softly: "He doesn't realize you're here. Stay here until I'm down, then sneak down and wait your chance. When we're in a clear spot, grab me and take off. OK?"

He just stared, eyes gleaming like a cat's.

The slowness caused by her bad rib was only half an excuse. At every cautious movement, branches seemed to maliciously catch on her clothing and body, and every movement set the knife

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in her ribs to jabbing her. The wet tree limbs tried to pull away from her hands, and the dimness—the storm was clearing, slowly—made it hard to judge size or distance.

She was dangling from what she thought was the lowest branch, her side one sea of fire, probing with her feet for the ground, when strong hands clamped around her ribs and lifted.

She screamed and knew nothing.

It was a scene straight out of Dante: naked bodies sprawled, red flames leaping and reflecting in wide, frightened eyes, moans, and the unmistakable stench of fear and sour urine.

Zoe's ribs hurt so bad it felt like her head would come off, but she slowly levered herself upright.

It wasn't the inferno, but a largish room, ceilinged and walled in dark, dark wood, with no windows except a couple of high, narrow ones. They were the source of the red—sunset?—glow.

Slowly she edged herself around.

Walls. The high, too-narrow-to-wriggle-out-of windows. One door.

No furniture. Seven bodies. And in one corner—the wreckage of wings.

Her fellow prisoners were all flyers. They all, like Zoe, had their hands bound behind their backs.

Zoe inched herself forward, until she could nudge the gently sobbing curl of misery closest to her.

She had to poke his ribs twice with her toes before he looked up, eyes swollen and red. "Can you tell me, son, what's going on?"

"He said—he said— I'm a flyer. I have to fly! I'll die if I can't fly!"

Zoe tried to keep her voice calm, her face from showing the dismay she felt. "What did he say?"

"That—that—that—"

"That you little sky-pissers had done over five thousand dollars damage to my orchard, and you're going to stay here and work it off."

Zoe had to hootch around to see who was speaking. He was standing in the doorway, shotgun dangling carelessly from one leather-gloved hand, looking, in his red-checked flannel shirt and well-worn denims held up by matching denim galluses, like an illustration from a Paul Bunyan story.

"You can't be serious." She spoke, one adult to another.

"Can't I?" He shut the door behind him, leaned against it, heavy boots planted as firmly in the packed dirt floor as one of his own trees. "Can't I?" He was smiling, but it was as grim and menacing a smile as Count Dracula could have produced. Firmly: "It's done."

"Pleeeeeease—" The boy nearest Zoe scrambled up on his knees to stare up at his captor. "If I can't fly, I'll die!"

Paul Bunyan—or whatever his real name was—shrugged. "Honest work never killed anybody." Than, with another shrug: "But if you do croak, useless, I promise not to add your unpaid debt to the others."

"Aiihhhhhhhhh!" The boy fell over and lay, screaming, legs kicking.

"Lincoln freed the slaves," Zoe pointed out, raising her voice to carry over the screams. "You can't force anybody to work for you."

"No?" Thick shaggy brows raised slowly. "But them as don't work, don't

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eat." Then, the thick brows frowning: "You're not one of them."

"No."

"Old enough to know better." He snorted. "That makes it worse."

"No," she repeated. It wasn't easy, hands tied and ribs screaming, to get to first her knees and then her feet, but she managed. "No. You can't."

A grudging glint of admiration showed in his eyes. Then: "If you're thinking to run that cracked rib into your lung and get out of this, forget it. I'll just add your hospital bill onto your share of the debt."

Patiently: "There is no debt."

"No? I can have an assessor in, if you want. Costs a fee, of course. But I've gotten mighty good, the last few years, at estimating the extent of sky-pisser vandalism." He didn't sound angry, he sounded tired.

"Vandalism?" The professional stood up and was ready to take notes. "Deliberate damage?" She turned and looked at the kids; now lying, except for the boy still screaming, limp and whimpering. They looked as vulnerable as day-old puppies, and about as destructive.

"Deliberate or not—" He sounded like a man at the end of his tether. "—does it matter? It's done. A whole branch broken off to get at a single apple, I'd find it later. Malicious breakage. Crud dropped from the sky. Whatever." Louder: "You useless clots, listen to me. Your wings are broken. There are tall fences around this place, they'll do to keep you in good as keeping land trespassers out. You'll work, or you won't eat. That's all."

"Kidnapping is a crime."

"So's trespassing." A breath. "I came down to check whoever needs patching. How are your ribs?"

Sourly: "It only hurts when I laugh."

"I'll tape them for you." There was weary-to-death unmistakable in both voice and body; but underneath was a rock-hard stubbornness that made her wonder how long he would hold on *after* he was dead. "But you mustn't keep the tape on for too long, you can damage your lungs. Just while the pain's worst, the first few days, and be sure to take the tape off when you sleep." He set down the tin box he was carrying and propped the shotgun against the door. "Anybody else need patching?" he raised his voice to ask.

"I hurt all over," a high voice whined.

"I want my daddy!"

"I want my wings!"

"Shaddup!" His voice was deep and rumbling. "One at a time, you crybabies. I want to know if anything's broken, sprained, dislocated, whatever."

Sobs, whines, and complaints were all that answered him. He said a short, explicit word, and opened the box and pulled out a roll of tape. With scissors, he cut her hands free and positioned her arms away from her body. "Hold still," he growled, and knelt to begin winding the tape around her upper torso.

When he was through, she held out her hands wordlessly, wrists together.

He squatted back on his heels, stared up at her assessingly. "Old enough to know better," he repeated. "So why?"

She shrugged and flinched. "I'm an ethnologist, a scientist who studies people's living patterns. Flyers are my current research subject."

"Holy Mary—" He rumbled to his

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feet like an avalanche falling upward. "A scientist—" His eyes narrowed; wheels were clearly turning within. "I'll talk to you again after I get through with the rest of these spineless ninnies."

"You'll have to do it all yourself," she said gently. "I doubt that any of them knows the difference between a break and a bruise."

"I could show 'em my orchard," he said sourly. "There's plenty of breaks there."

"From the storm? From us falling?"

"Ay-yeah. And from previous damage."

"Five thousand dollars, you said."

"From today. Conservative."

She believed him. Gently: "And, say, the last year?"

He shrugged.

"Insurance?"

His smile would have made Dracula himself flinch. "It's not an act of God, it's not deliberate malice. Sky-pisser vandalism falls through the cracks."

Without thinking, she pulled the relay off its clip on her hipband, and said, "Noss, Q: What is the reported amount of flyer vandalism and damage reported for the last month?"

The tinny voice out of the relay gave a single figure. She gasped. Then: "Q: Estimated total for all such damage and vandalism, reported or unreported."

The figure was many times higher.

"What is that thing?" her audience asked, uncuriously.

"A computer. Well, a relay."

"Oh. Tell the damn thing to figure out how to save my orchard, huh."

Her lip twitched. How many times had she run into that attitude. "Do you use a computer?"

"Sure. Have to, for the RedTape alone, but it helps with fertilizing, lotta other things."

"Does it figure out stuff by itself, or do you have to tell it what to do?"

He sighed, and turned to the nearest flyer.

"Hey." Zoe, as she so often did, had a question. But he ignored her to kneel awkwardly next to the thrashing body. He administered a careful slap, then a second; the girl went limp and stared up at him accusingly.

"If you're hurt, all that thrashing makes it worse. Hold still, and I'll check you out for damage."

"I'm a flyer," the child on the floor informed.

"Yeah. I know. But you got bones, and some of 'em might be broken or dislocated. Can't patch what I don't know about, so hold still and let me look."

"You a medic?" the girl, her face unpainted except for black circling her eyes, making her look like a worried raccoon, asked suspiciously. Several of the nearest flyers had quieted and were staring at the three.

"Flyer," Paul Bunyan informed, "the nearest medic is fifty miles away, and he charges more than I'm worth to make house calls. Out here in the boonies, we do for ourselves, except in an emergency."

"I'm hurt! It's an emergency. Call an ambulance."

But Paul Bunyan merely muttered a curse and began a rough but thorough examination, punctuated by the girl's howls of agony.

Zoe moved forward to interfere at the first screech, but she heard more petu-

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lance and fear than pain in it, and leaned back.

Paul Bunyan spanked the girl's hip. "Nothing wrong but bruises and stiffness, and a hot soak and some honest work'll take care of them."

"I'm dying."

Rising to his feet: "Useless. But you'll work. Or else."

"I want my wings. Now!" greeted the boy the man walked over to next.

"Shaddup." He knelt again, began his examination.

His patient cuffed him. "I said, I want my wings."

The boy might as well have struck a stone wall. "Tough." He continued to probe. "They broke when you fell."

"You broke them." It was a boy about a meter away. "I saw you."

The man froze, and kept his face down toward his unwilling patient. But red glowed dully on his forehead.

Ethnologists have to be somewhat of psychologists, too. "It was better than breaking one of us, wasn't it?" Zoe asked softly.

He looked up, shame on his face, and his hands, pulled away from the boy, clenched and unclenched restlessly. "My dad used to say, Two wrongs don't make a right."

"Your dad was a wise man."

"Yeah. Y'know, for the first time, I'm glad he's dead." A swallow. "He died happy."

"I'm sorry." She didn't mean that she was sorry about his father.

"Yeah, I think you are. Not that it makes any difference."

She patted his shoulder. "Of course it makes a difference. No human being lives alone, in a vacuum."

"No?" He bent down, continued his work.

She understood the unspoken disagreement. "They have each other."

"A society of unthinking children. Great."

"Their society. We do better—" Reminded, she opened her relay. "Noss. O: I want a line to Ms. Dubonnet. Use whatever priority necessary. I want to speak to that woman, and I want to speak to her *now*."

He moved to another patient, but she had the feeling that he was listening to her, not to the child he was examining.

"Yes, Dr. Fidelio—" Came the familiar acid tones. "Why no vision?"

"Irrelevant. I have a report to make." The man didn't pause in his careful work. "I just survived being caught in a hailstorm. I have broken ribs. We are checking for other casualties now."

"Other cas—good Lord!"

"I thought you ought to know." She couldn't say more, not in front of an audience.

Ms. Dubonnet was sharp. "My dear Dr. Fidelio, I do hope you're all right, that this little incident won't delay that project you're working on for me."

"It might."

Sucked in breath clearly audible. Then, briskly: "That bad?"

"Worse. If anybody had asked me a couple of days ago what effects a little weather would have on flyers, I would have laughed. I'm not laughing now."

"My dear doctor, heads will roll for this, I assure you. I can't apologize sufficiently. Is there anything I can do?"

"Ahhhhh!" She had shifted position, and a spear of pain reminded her to be careful. She drew in another breath on

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a gasp, and said, "No—wait, yes. Notify the U. Tell them to arrange a sub for me until further notice. Ouch!"

"My dear doctor—shall I send an ambulance?"

"No. I'm being taken care of. But you can do one thing: did you know that current insurance policies don't cover flyer damage?"

"Yes. And—"

"Do something about it. Now."

"Doctor Fidelio, aren't you the one who told me that bureaucracy and speed were incompatible terms?"

"Do it. Now. Retroactive."

Low but with as much warning as a cobra's angry hiss: "Dr. Fidelio—"

She was in too much pain to be tactful. "You want my help, don't you?"

Amusement: "Dr. Fidelio, I know you ivory tower types. Once you discover a problem, your hungry little brains keep working away at it." On a different note: "We're not entirely stupid. The wheels are grinding."

"Make 'em grind faster. God, I hurt!"

"Dr. Fidelio, an ambulance—"

"If I need, let you know. Fidelio out."

He was staring at her openly, wary, puzzled. She remembered what she'd been about to ask, before she'd been distracted. "Why aren't you worried about my relay?"

He didn't smile, but smugness radiated from him, like the ring around the moon before a storm.

"My relay. The comm. We could call for help. I could have just now, you could have stopped me—"

Instead of answering, he gave the boy the same spank he'd given the first girl.

"Go to sleep, useless. You're going to need it, come morning."

"I want my wings."

Paul Bunyan rose. "First you work off your debt. Then you earn enough for a new pair of wings." Feral smile. "At minimum wages, it shouldn't take more than a couple of years or so."

"I want my wings now."

Paul Bunyan just moved toward the next flyer.

"I said—". He reached out, grabbed an ankle. "—I want my wings *now*."

Paul Bunyan shook the hand away. "Useless, you may as well learn now as older: You can't always get what you want as soon as you want it."

Wail: "But I want my wings *now*. I have to have my wings! I have to fly!"

Three or four of the others started howling in chorus.

"Holy Mary—" He cursed.

All the kids were screaming.

"Shaddup or I'll see to it none of you ever flies again!" He had to repeat it twice, but then he got dead silence.

"You can't!" sniffed a girl in a corner. "Can you?"

"Try me." He just stood there, solid as one of his trees, and all the kids stared at him, eyes reddened—and said nothing. It was his size, Zoe thought, and that stubbornness of his that awed them. For all the anger and rage roiling in him, he didn't seem, well, bad.

"Ground rules," he said. "You'll sleep here tonight. I'll have something better tomorrow night, if you deserve it. You'll get breakfast tomorrow morning, but after that, no work, no eat. I'll keep track of the hours you work; at minimum wages, you each owe me about a hundred and forty hours. At

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that, you ain't worth it. But I'll pay minimum. When you've worked off your debt—''

''I don't owe you nothing!'' It was a girl in the corner.

''I have broken apple trees say different.''

''Nothing!''

''My dad'll pay you.'' A sullen boy lying under one of the windows, hitherto mostly silent.

''Will he?'' Paul Bunyan took a couple of steps toward the boy. He sounded almost genial.

''Sure.'' The boy did sound sure.

''But I'm not,'' Paul Bunyan said softly. ''Maybe he'll pay, and maybe he'll turn it over to his lawyer, or to his insurance agent, and everybody'll wrangle, and I'll have to get a lawyer, and by the time I've waited, and paid fees, even if I get my money, I'll have paid it out twice over in time and expenses. No thanks, useless. A bird in the hand—'' Nobody chuckled. ''You won't be worth half what I'm supposedly paying you, but my satisfaction at watching you put out honest sweat for once in your life'll make up the difference.''

The boy didn't look scared, just petulant. ''No.''

''Ever been hungry?''

No answer.

''You will.''

Silence.

''Anybody I missed think they're really hurt, say so.''

Heartbeats ticked off.

''My ankle,'' said the boy who had been so hysterical from the beginning, in a small voice.

''Let's take a look—'' Paul Bunyan moved over, knelt, probed gently, ignoring his patient's gasp. ''Probably not broken, may be sprained,'' he diagnosed. ''Bring you an ice pack for tonight, and for you—'' Turning to Zoe. ''—a sleeping bag, until the ribs are less uncomfortab—*One more step*—'' Suddenly it was not just his size that made him menacing.

Zoe swung around, and almost blacked out from the pain. But she saw the sullen boy who claimed his father would pay, frozen a few steps from the shotgun.

''Touch me, and my dad'll *break* you,'' the boy threatened.

''Touch that shotgun—'' Paul Bunyan spoke in almost conversational tones ''—and you won't live to see it.''

''You wouldn't dare—'' But there was just a hint of doubt.

''Boy—'' He rose slowly. ''Four years ago, I was the only survivor of a car accident. Six people died. My father, my mother, my wife, my three children. All I have left is this farm, and I'm losing that. Be careful. I don't much care.''

The boy recognized truth when he heard it, and stepped back.

Paul Bunyan walked over and picked up his shotgun. He turned and faced the room. ''Ground rule,'' he said. ''Anybody who even looks like grabbing this gun or any other weapon, gonna be mighty sorry. I won't do any damage that'll stop you from working, but you'd be amazed at how much pain and injury you can have and still work. I ought to know, I've been there. I ain't gonna warn you again.'' To Zoe: ''Be back with the bag and the ice pack in a bit.'' Then, gaze swinging around: ''Last chance; anybody got damage needs medicking, speak up.''

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Silence, and he put his hand on the door.

"Wait—my arm—"

He came back, checked. "Broken," he told the girl, a tiny China-doll with brilliant bobbed emerald hair matching the slanted emerald eyes, succinctly. "I'll bring a splint, be thinking of some one-armed jobs for you."

"It hurts."

"It won't hurt as much once it's splinted and slinged."

"It *hurts*."

"Holy Mary—" He rolled his eyes skyward. "More trouble—" he mumbled, then: "I'll bring you a pill."

It was when he was leaving for the second time that Zoe put out a tentative hand. "Wait. One question. You never answered me before."

He cocked a shaggy brow.

"Why you weren't that afraid of my contacting the authorities."

"Look at your thumb."

It was dirty. Like the rest of her.

"Ink smudge. I had itinerant worker contracts. You've all thumb-printed 'em. Quite legal."

"But I'm literate!"

He grinned, suddenly. "That's why the changes you also thumbprinted are legal."

Zoe spent more time thinking than sleeping.

Eli Harris, AKA Paul Bunyan, slumped his large, farm-fed self into a chair and glared at Zoe.

She got in the first lick. "Who sold you this antiquated system?" she snapped. By mutual agreement, she had done only the most minimal outdoor work. Instead she was working on the "Books": the RedTape any business—and farming is a business—needs and hates.

"It was all I could afford," he said, with a shrug in his voice instead of his shoulders. "Second-hand."

"I don't know how you've managed," she said. "Even with Noss—" The flying lab was in its garage back at the U; but the portable part of Noss was sitting on the table next to Eli's system. "—I'm going three steps backward for every two forward."

"Do what you can." He shifted, and a whiff of chemical tang underlaid with sweat and over-ripe compost wafted from him. He gave the system a tired glare. "I'm surprised you lasted this long."

Zoe had to grin. "What the mind of man can devise; the mind of woman can by-God lick!"

"Whoever you were talking to that first night had you taped, didn't he? Get your teeth in an interesting problem, never let go."

"My God!" She jerked up, felt a twinge reminding her of what two weeks hadn't burned in: Move careful! "That showering bureau! I never called her back."

He leaned over, scratched under one of his heavy woolen socks. The thick-soled, filthy boots were no doubt sitting just outside whatever door he had entered the farm house by. "Can he do you much dirt?"

"He's a she, and you know what they say about the female of the species."

Eli/Paul looked blank.

"The female of the species is more deadly than the male," she explained.

He gave her another of his Looks,

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nodded. Then he cocked his head. "Go on, say it."

"I'm waiting for you to say, Ay-yup, like Gary Cooper."

"Ay-yup," he repeated, tasting the syllables. "Who's Gary Cooper?"

"An old-time movie actor, his films are often shown at Classics Nights at the U. And no, you don't look a bit like him, he was tall and lean and cheek-boney."

Eli snorted. "I'm tall, and I know I have cheekbones."

"Under all those whiskers? Are you sure? Anyway—" She punched in a Write-to-disk, turned "—to get back to the original question, loss of job, and total blacklisting in my profession."

His lips pursed. "Sounds like you didn't much want to do whatever-it-is he—she wants."

"I didn't. I don't. But I admit the necessity."

"Ah." He jerked a thumb at the system. "Like that. Necessary."

"Yes."

"For me." It was a question.

"Yes."

"Not for you." It wasn't a question.

She looked at her thumb. "But you've clipped my wings fair and proper, haven't you?"

"Thought I had. Them, maybe. But not you. That university of yours is big time, probably has lawyers and the like coming out of their ears. That contract ain't worth horse-plop, and we both know it."

"Probably," she admitted.

"So why you staying?"

She glared at the system.

He grinned suddenly. "Really had you taped. Can't bear to give up, can you?"

"Not just with this," she said grimly. "This time with you, it's given me time to think, about Dubonnet's problem, and a couple of my own."

"Good." He rose. "Come to remind you, lunch time. Find a stopping place and come on." A sly grin. "Little green-haired chick who calls herself Amelia insisted on making pies again."

"Oh, God!"

The grin broadened. "Asked me how, this time," he informed.

Zoe couldn't help a giggle. "When you cut into that other one, and there was that big congealed round of yellow staring up at you, a perfect fried egg—"

"It *said* to put an egg in the filling—" He mimicked Amelia's outraged plaint.

Zoe laughed, and he joined in, then sobered. "I need to talk to you. After supper. Here's as good a place as any, just don't get hung up in something, OK?"

"All right." She watched him shamble out, with brows drawn in, then shrugged and began shutting down. She'd find out tonight, though she had a good idea. Poor Eli!

They had had apple pie—inedible—for lunch, and apple pie—inedible for a different reason—for dinner. "I never realized there were so many ways to miscook apple pies," Eli said, as he dropped his large self on the faded mulberry-plaid covered chair in the corner.

"You shouldn't have produced that pie of yours so casually," Zoe informed. "Off a wood stove yet."

He shrugged. "I wanted it. Easy enough to bake plenty to go around."

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"But you made it look so easy—"

He shrugged again. "Well, one thing we got around here is plenty of apples. With the pigs, nothing wastes." He cocked an eye at her. "Can you make an apple pie?"

"I expect so. I can cook from scratch."

"Wanna take over? I'm short for time, and those kids sure can't."

"No problem. I guess my ribs can take it."

"Damn. I forgot."

"I said, they can take it. I wouldn't have said yes if I wasn't sure."

"Not that. I'm gonna have to give these kids the shove."

"But they haven't—"

"I know, and I damn well wish I could afford to hang on until they learn their lesson and learn it right, but I can't. They cost me too much in time, my time."

"Then they've won," she said soberly.

"Yeah. Think I can't tell what they're up to? But they do too much damage, acci—ha—dentally, and they need too much of my time to supervise, and—"

"How old were your kids when they died?"

"Oldest was ten. Why?"

"Because I wondered why you didn't recognize the tactics. Or didn't your kids use them?"

"Oh, yeah." He got out a battered meerschaum, filled it with tobacco smelling strongly—what else—of apples, and puffed to get it lit. "I recognize them. My kids were no angels. But I got limits."

"I'm sorry."

"So'm I. Sooner or later, those kids are gonna learn the hard way that life ain't one long Happy Hour. The longer it takes, worse the shock's gonna be."

"So—what are your plans?"

"Figure to give them two more days of the muckiest chores I can come up with—cleaning out the far barn, turning the compost pile, stuff like that. Then—" No change of tone. "—reckon I'll dump the lot of you in the river, weights on your feet."

"You can't—" She sailed to her feet.

"Sure I can. Do it with kittens all the time." He winked, and made a gesture with his head toward the door. "You sky-pissers are just bigger, that's all." He took an easy drag on his pipe, and the sweet scent of apples and tobacco filled the air. "Thought I'd give you a chance to stick around a while, you've been mighty useful fixing that monster for me."

"Oh, Eli," she said loudly. "Of course I will. I do so want to be useful!"

"Reckon'd you would, if the matter was presented to you in the right way," he said dryly.

She went over, warmed up the system.

Someone listening? she typed in, and the letters flowed onto the screen.

"Yes," he said, enjoying himself, "I knew you were smart enough to see the light, lady."

"I—" She turned the screen off. "—think I need something stronger than coffee. How about you, Eli?"

"A drap of the craytur wouldn't hurt." He stood up. "I'll get it. You don't want to put any unnecessary stress on those ribs." He made a fair amount of racket standing up, and then strolled out the door.

When he came back, she was staring

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at some figures at the screen that he knew, at a glance, had nothing to do with his farm.

"Got some answers?" He handed her a glass with condensation already forming on its sides.

"To the big question, probably. But Eli, I deal in trends, in—in the big picture. When big trends are moving—"

"Sometimes little people get ground up in the gears." He sat back down in what had to be his old, favorite chair, its dent as Eli-shaped as if it were a Formfit. "I know. Known that a long time."

She chewed her lip. "The answers are there. All of them. If I only knew how to ask the right questions."

"That's life." He drained his glass and set it down with a controlled clink.

"It isn't fair."

"For the first time, you sound like one of them. Life isn't fair."

Four days later, in the small study, Eli was saying, "Well, it worked for a couple of days anyway. Tomorrow I give them a choice. Work voluntarily, or leave." His lip twisted. "Do you think even one of them will stay?"

"Amelia," she answered immediately and honestly. "At least until she produces a pie as good as yours."

Zoe was wrong. Eli made his little speech the next day, and all the kids walked out through the open gates, not looking back.

Zoe stayed another week, getting Eli's system into smooth running operation, but she had to return to the university, and her interrupted project. She couldn't fly, of course, until her ribs were totally knitted, but there was plenty of the despised analysis and paperwork to be caught up.

She never expected to hear from Eli again, except an occasional how-you-doing-call. She was wrong about that, too.

Even over the screen, he looked terrible. "A flock paid me a visit last night," he said numbly. "They did —damage."

"Oh-my-God."

"I've an insurance assessor out here now. At least it's unmistakably vandalism. But—" He spread out his hands.

"I'll be there as quick as I can."

"There's nothing you can do. There's nothing I can do. I just wanted you to know." He spread his hands. "Maybe it'll help your—your project. Maybe prevent it happening again."

"Eli, don't do anything until I get there."

"Some things I gotta do."

"Don't do anything permanent, you hear me!"

"Won't make no difference."

"Do as I say!"

"Bossy woman." But he sounded a little less dead.

She called Ms. Dubonnet en route. The bureau expressed regret, but wanted to know what this had to do with the main problem.

"I don't know," Zoe admitted, "but I have an intuition—you willing to listen?"

Ms. Dubonnet was willing to listen.

"Solve his problem—and it's prob-

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ably typical as nasty side effects of flying goes—and you may solve yours."

"I thought you said the kids all walked off his farm."

"They did. All seven of them. Not a statistically large sample."

"Humph. Will he allow photographers in?"

"He's numb. If I asked him, he probably would. Why?"

"Weapons. There are bills pending to help with situations like his. And to up the licensing fees for wings to take care of them. A good nasty example always helps."

"You send 'em, I'll see that they get an eyeful."

"Good."

The flock had done a thorough job. While Eli slept, they had dropped in and broken into a locked barn. Eli had plenty of weed spray; they had hit both his truck garden and orchard. Every tool he had that could possibly attack a plant or tree had been used. The orchard was mangled, and so were all the animals the flock could get to. The air reeked of sour, spilled blood.

As a final gesture, they had emptied all Eli's supplies of gasoline, kerosene and the like on the house and structures, lit up, and lifted off. Eli woke up when the first alarm went off, called for the fire department. But it had been dry for quite some time.

About a third of the house was left, a blackened finger pointing accusingly upward. The largest barn was a pile of debris, and it stank of roast meat. The smaller barns—

"Will you survive?" The camera crew, supposedly hardened professionals, were subdued. The assessor was wandering around, muttering to himself. It was almost obscene, that the day was so sunny and cheerful.

Only part of the orchard had burned. The remains looked like black crosses, lined up in a cemetery. The trees that hadn't burned looked worse.

Eli stood, more like Paul Bunyan than ever in his muddy flannels and denims, his heavy boots. "I will. I'll have to sell, of course. With luck, the insurance and sale price will cover the mortgage, leave me free of debt."

"You can't sell," Zoe protested.

"Can't not. But I won't starve. Good field hand's never out of work." In the same tone of voice: "My great-great grandfather built that house."

"Eli—"

He looked down. "I'm alive. I don't intend to do anything about that. Just keep on living, doing the best I can. Don't worry. Giving up all the way is for kids who don't know how to take it. I've had practice."

Eli and his tragedy were all over the local newscasts, but Zoe didn't pay much attention. She was too busy trying to help Eli salvage what he could, and talk him out of putting his farm up for sale immediately.

"Mortgage payment's due," he said. "Insurance, utilities—"

"I'll talk to them. They'll wait. Better than not getting paid at all—"

"They know I'll pay. Eventually."

But she went in. They were waiting for her, and all agreed to wait for payment. The bank, somewhat to her surprise, refused to take extra interest on the delay. "Just what he would have

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paid," the banker assured her. "When he's ready."

"Good money after bad," Eli said. But he didn't tell the agent to put the farm up for sale.

The flyer grounded the afternoon after Eli's fire had gotten a two minute spread on the national evening news. Luckily, Eli had no more lethal weapon handy than the hammer he was using to put up a temporary stock fence.

Zoe grabbed his elbow and hung on, but he stopped anyway after taking two steps toward the tiny flamboyant figure. "What do you want?" he asked.

"Mr. Farmer, sir," the little voice piped up. "I just heard. About what happened, I mean." She looked around, and her eyes widened. "It's all destroyed. Why'd they do that?"

"You're—one—of—*them,*" Eli said hoarsely.

"Of course," she said, in her little girl voice. "I was here before, you remember me, Mr. Farmer, sir. I'm Amelia."

He took a step toward her. "You're—one—of—them!"

"Eli!" Zoe dug her heels in, but she might as well have tried to stop a mountain walking.

"I came to say I'm sor—*don't you break my wings again!*"

She back-pedaled a couple of steps, but the hand, big and hard as a sledgehammer, and as destructive, dropped to his side. He just stood there, trembling. "A child," he muttered. "I can't—"

It was Zoe who asked, "Why, Amelia? Why'd you do it?"

"Why'd *I*—" Slanted green eyes widened. She was tiny, Shirley Temple dainty with a China-doll bob of jewel green hair instead of golden curls. "Oh, Mr. Farmer—Lady—you don't think I did any of this?"

"It did seem rather likely," Zoe said dryly. Eli had covered his face with his hands and dropped to his knees, swaying.

"Mr. Farmer, please." With him on his knees and her standing, she was still shorter than he was. "Mr. Farmer, please, I didn't. I don't know who or why, except they said it was flyers, but it wasn't me. I didn't know." She grabbed him around the shoulders, buried her face in his shirt. Muffled: "I didn't know."

Eli let out a strangled groan, then he was crying, those great, ugly, helpless, whooping sobs of someone who has held it all in much too long. Amelia, face buried in his chest, was sobbing too, a high soprano whimpering. Then his arms whipped around her, and the two of them were swaying, and crying.

Zoe felt close to crying herself. Instead she went over to the old handpump, filled the metal cup that hung on a hook, and then took off and soaked the big bandana she'd had tied around her neck.

And waited.

"Go-oo-od." It was a shuddering sound almost inaudible. He pushed Amelia a little away. "Go-oood." He was still on his knees, big hands dangling, head bent.

"Please don't say you're angry with me, Mr. Farmer, sir," Amelia said.

He sighed and shuddered, and slowly, wearily, tried to push himself to his feet.

"No." Zoe took over. "Sit and rest, Eli. Drink this."

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"I feel such a fool." He took a long drink, while she wiped his face.

"You've driven yourself past exhaustion, feel the fool for that, not a normal human reaction."

"Please don't say—" Amelia started.

"I'm not, child." He held out the cup. "Here. Have a drink."

"Thank you." She had furled her wings when she first landed. Now she slipped out of the harness completely and laid it carefully aside, to come and sit down facing him, to take the cup and gulp a long drink.

Zoe, with a sigh, sat down beside Eli.

Amelia was the first to speak. "It's awful, isn't it?"

Zoe simply nodded.

"It's ruined."

Zoe nodded again.

"Can—can anything be done?"

Zoe started to shake her head again, then, slowly. "I don't know. There's a possibility . . . "

"I came—I thought—you know—help a little. I didn't *realize*—" Amelia looked around again and shuddered.

Zoe very carefully didn't say anything. Eli was, for the moment, totally numb again, his eyes moving over the devastation, unseeing, the cup in his hand half way to his mouth.

"I could come and help—" Amelia offered. "These are my sister's wings. She started at the U last year, she only rides them on weekends. I couldn't understand, how you could give up so much flying; but it means I could come, on weekdays, anyway—and—and maybe some school vacations—"

"Eli—" Zoe nudged.

"Oh-ah-yes." He came back to earth, slowly. "Ah—thank you, child." He patted her hands, his own big and filthy and battered, hers small and white and neat, the nails clipped to the quick so as not to scratch the wings. "But I don't think—" His shoulders rose and fell. "I don't think it will make any difference."

"Maybe I could get some other flyers, too—" Amelia said slowly. "I mean, flyers did this. And—and—if we got a lot, and each one didn't have to stay too long—you could tell us what to do—"

"They won't come." Eli began to heave himself slowly to his feet, Atlas ready to take his burden up again.

"Most won't," Amelia agreed, running over to her wings and shrugging them on. "But there are lots of flyers—" Zoe automatically stepped back, taking Eli with her. The wings had to beat like sixty to launch even as small a burden as Amelia from the ground. Amelia began her take-off run, her wings beating, stirring up dust, flipping Eli's long graying dark hair—grown even longer during the crisis—into his eyes. With the ease of the small and skilled, she leaped upward, sailed over a fence and was off.

"Do you honestly think—" Eli was afraid to hope.

"I can't say."

The first flyer, a slim naked boy with wings painted with the scowling face of a crimson hooded Emperor Ming, landed about an hour later.

"How many flyers took part in Operation Restitution?" Ms. Dubonnet wasn't convinced that Eli and his problems and the reaction of the flyers were the answer she wanted, but she intended to stay up-to-the-minute regardless.

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Zoe shrugged. "Noss has the data. Not that it matters. I think what's important is the few kids that came back for the second day and even a third. I have them all ID'd, but I'm especially interested in the repeaters."

"And Mr. Harris?"

"His situation's still iffy, but—" Her lip curled upward in satisfaction. "There isn't a farmer within a thousand miles who has a piece of equipment, some raw materials, a transplantable tree, extra supplies, that the kids haven't approached. Amazing how generous they were. Those who couldn't afford to give, the kids did chores for. Flying if they could, crop dusting, harvesting tree crops, whatever. Ground chores if nothing else. They have Eli's truck farm ready to replant, and he anticipates a small fall cash crop, plus the destroyers missed the strawberry beds completely, probably didn't realize what they were. He'll be able to manage a cash crop from them, too, plus what he'll get for the dead animals, except for the ones he got butchered and into a rented freezer for himself. He'll be eating meat until it's coming out of his ears, but at least he won't have to buy food."

"But I understand the orchard's his main source of livelihood, and that was destroyed."

"Some of the trees were totally destroyed, which means years, assuming he can afford to replace them, before he sees a cash crop out of their replacements. But some were only damaged. Eli has to prune them back, but depending on how much, he'll be seeing apples off them again sooner or later. But he's not going to replace all the most damaged area of the orchard, he's shifting over to annual crops, extending the truck farm, so to speak. It's a lot more work, more than he can handle by himself, but he's hoping he'll have a few helpers every day from now on. He can't afford to pay regular hands, but he's a one-man army in himself, and given even two or three unskilled helpers, he figures he can manage. Anyway, if it works, he'll be able to replace the orchard, but slowly, it'll mean twenty years, maybe, before he's completely productive the way he was before, but he's nothing if not patient." Breath. "A little of Uncle's money, with no strings, would help a heap."

Ms. Dubonnet took a drag on the inevitable cigarette and grinned. "Ivory tower type, don't you know bureaus waffle and take forever, and the more important the matter, the more they waffle, and take forever."

"How big a check, and when will it get here?"

Ms. Dubonnet looked mildly alarmed. "I said you might have this chair one day, Dr. Fidelio, but not while I'm still interested in it."

Zoe stretched luxuriously. She had been using muscles she hadn't used in a long time, and they had ached the first few days. Now she just felt deliciously tired when the sun went down and the farm began packing up. "I have your answer," she said smugly.

"Ahhhhh!"

"You aren't going to like it."

"That bad."

"Take care of Eli first.'

"*That* bad."

"Worse."

"If I try the stick instead of the carrot—"

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Zoe laughed.

"There is a stick—a double stick, since you've interested yourself in the affairs of Mr. Harris—"

"I'm thinking of getting married—"

Ms. Dubonnet rubbed her hands gleefully.

"—to a fellow professor at the U."

Ms. Dubonnet's still-dark brows soared upward. "You continue to show your uniqueness. I had assumed—"

Zoe shook her head. "Not in the cards. Is Eli's check in the works?"

"Stubborn."

Silence.

Ms. Dubonnet produced one of her perfect smoke rings. Then: "Yes."

"Good. OK. Your answer—" She sighed. She was back in her own home for the first time in ages, and the garden was sadly shaggy. "There is no answer."

Ms. Dubonnet reared up out of her chair. "You—"

"Be quiet. Listen. There is no answer in the sense of a neat, tie-it-up, make-it-go-away. The problem's here, it's going to stay; you're going to have to learn to live with it and cope with it. What I can give you are some helpful policies."

"Go on."

"First: Accept that you're going to lose some kids to flying. Out and out lose. Just like alcohol, drugs, video games, rock'n' roll, and every other innovation back to the caves and up to the industrial revolution have claimed their victims. What you have to do is first, minimize the loss, and second, minimize the trauma, both on the kids who come through and grow up and go on, and the people like Eli—"

"Will they grow up and go on?"

"It's too soon to tell. But if you want my educated intuition, I'd say yes."

"I accept that much. Go on."

"Minimize the trauma of outside people. You can't do much for the parents, but for people like Eli who get caught in the gears—"

"I said, his check's in the works."

"Do you have any idea how much damage the kids did *before* this final incident? They're up in the sky, and they don't care what they dump. Or they get hungry, swoop down and grab. Cause damage in a lot of other ways."

"So?"

"You're going to have to do more on that. The licensing fee on wings, big enough to pay insurance on flyer damage, is only a start. Make it renewable every six months, and make damn sure the kids understand that if any of them damage, they all pay. And of course, if they get caught doing damage, malicious or accidental, the wings get confiscated."

"How do I enforce that?" Her to-the-shoulder earrings, leather ankhs, quivered as she shook her head. "You think I'm made out of money, you think people aren't griping over taxes, you think—"

"Well, that's idea two. You need help. Cops can't handle flyers, even the new corps of flying cops. What you need are—"

"More ways to spend what I don't have!"

"More ways to spend money. More effective ways. Think about it. What's that old saying, Set a thief to catch a thief? I wonder how many of the older

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kids would jump at the chance to earn while they fly?"

"My God! You're talking quislings."

"I'm talking recruits. The first bunch slowly weaned from flying-is-a-way-of-life to flying is the best part of my life and my profession."

"How do we find them?"

"Start with the kids that had enough conscience to help Eli. Then go from the other direction. You've always had kid volunteers in all sorts of fields, from helping at orphanages to pushing carts in hospitals. 4-H clubs. Future teachers, whatever. Work from that end. Conscientious kids. Some of them will be part-time flyers. Recruit 'em. All they need is a whistle, a comm of some sort to alert authorities when no-nos are taking place."

"You know what those kids are likely to do to what they consider traitors?"

"Make it unobtrusive, and warn the kids not to use it too often. Best thing, if every flock has 5 or 10 percent spotters."

"What else?"

"Think about licensing flyers themselves, not just the wings."

The bureau shook her head. "Too many. Be like licensing joggers during that big fitness craze when I was young."

"Think about it."

Zoe continued to talk, and when she finally ran down, Ms. Dubonnet said sourly, "That's it, then. What you're saying, is Grin and Bear It, plus some ideas for coping." She shook her head. "Not good enough."

"You'll have me, and others like me, to help. Now. Later." A wry smile. "I know that the answers will change with time, just as the problem will change with time."

"Great. Marvelous. I needed that last bit especially."

Zoe stared pointedly at the cigarette held between two gaunt fingers. "You're still smoking."

"You want to *what?*" Ivan sat down abruptly, not through choice, his knees just gave way. Since Zoe had been anticipating some such reaction, he was standing right in front of her softest lounge, and fell neatly into it.

"I want to give Eli a son," she repeated patiently. "Artificial insemination, if natural bothers you, but I want to give him a son, and I want to do it now—"

"Why?" he gasped.

"Why me? Because farmers are a dying breed. Eli doesn't know any women of his own type who aren't way too young, or already well and happily married to somebody else. As for the kids—even if he could see them as adults, and his feelings for them (if he developed any) not as a form of child molestation—he couldn't trust them for the mothering, nurturing part. I can't spend a lot of my time on the farm, but what I can give will be effective, I can by-God mother and nurture. My child by Eli wouldn't lack, and he knows it."

"You've talked this over with him already."

"No. I wanted to give you your chance first. If you still want to marry me. And have children by me. But the first child must be Eli's, because he's so much older than you or I."

"I—have to think it out."

She caught his hands. "This isn't a

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frivolous whim, Ivan. I've done a lot of thinking about it. We could also plan to spend part of our lives on the farm, not just because of my child, but because it would be the best thing possible for all our children."

"It just hurts that you're so eager to give him what you refused to give me."

"No. Don't even think it, Ivan. I didn't want to bring *any* children into the world, because I thought it was wrong, the foolish thing to do. Now, I've—grown up a little. I know better. Even if you get hurt, it's the right thing, the only thing to do. The skein of life must go on. Eli taught me that, and I'm grateful. I want to give him a child, because he needs, and because he is what he is, and what he is should go on. But I want to marry *you*."

"I . . . see. I think. Have you —mentioned this idea to him at all, this Eli?"

"No. He lives in a different world, an older world, a conservative world. I considered simply seducing him—he's human, after all—and presenting him with a fait accompli. But that's unfair."

"My thanks."

"To all of us. Don't make a hasty decision, Ivan."

He snorted. "You're talking about a troika marriage, Zoe. In essence, in feelings, perhaps even economically, if not sexually. It may come to that, too."

"No. Not Eli. Not enduring, earth-father Eli. Even if the chemistry were there, and it isn't, I couldn't spend the rest of my life, solid, on his farm, and he's as aware of it as I am. No, sooner or later, he'll find someone, or I'll find someone for him. This is a big country after all, and there's bound to be one displaced farm-woman somewhere, or maybe a city woman who feels a misfit, and would appreciate spending the rest of her life on a farm, with a solid, caring, nurturing, responsible, salt-of-the-earth like Eli. Maybe even give him more children, if she's not too old. He's old-fashioned, he won't take someone too much younger than he is. But even if we find someone, and she can give him children—he needs now. He needs to have that first child now, soon as possible, or he'll be too old to train him properly when the time comes. Ivan—" She caught his sleeve. "I suppose I could find a surrogate mother for him, in time. If you feel too deeply about it, I might consider it. But I'd rather do the nurturing myself. And I do so want one of my children to have that heritage of his, not the physical heritage, the farm, but—but—" She waved her hand helplessly.

"I understand," said the man whose ancestors had been nomads, but tied to their desert, or farmers, run from their land. "But one thing I still don't understand, you were so vehement, so vehement about not having children."

"I guess I don't want to be bracketed with those kids, in any way."

"You mean, because they won't have children?"

"Not exactly. They won't have kids because it would interfere with their flying. What I meant was, you can take what life hands you, or you can fight to make it better. They just take, passively. I intend to fight. And the first salvo—"

"I see. Eli's son." He stood up. Part of maturity was knowing when to accept half a loaf. "Come on, darling, I can't wait to meet the father of our first child." ■

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the reference library

By Tom Easton

Subterranean Gallery, Richard Paul Russo, TOR, $3.95, 344 pp.
Gryphon, Crawford Kilian, Ballantine/Del Rey, $?, ? pp.
Carpe Diem, Steve Miller and Sharon Lee, Ballantine/Del Rey, $3.95, ? pp.
King of the Sceptered Isle, Michael Greatrex Coney, NAL, $18.95, 399 pp.
Quest for Apollo, Michael Lahey, DAW, $3.95, 255 pp.
To the Land of the Living, Robert Silverberg, Questar, $?, ? pp.
Starbridge, A. C. Crispin, Ace, $3.95, 336 pp.
Strange Invasion, Michael Kandel, Bantam, $3.95, 153 pp.
Escape from Kathmandu, Kim Stanley Robinson, TOR, $17.95, 320 pp.
Pulphouse 4 (Summer 1989), Kristine Kathryn Rusch, ed., Pulphouse Publishing (Box 1227, Eugene, OR 07440), $17.95, 247 pp.

I don't know the people involved. What I am about to say is therefore an interpretation of what evidence comes my way: novels and the acknowledgements that accompany them. What that evidence points to is that there seems to be a group of science fiction writers in San Francisco and Berkeley who are intensely concerned with the function of art in society. The first member of the group who identified herself to me was Pat Murphy, whose *The City Not Long After* proclaimed that the pen—the artist—is mightier than the sword—the bloody-minded soldier. Sadly, her book, while clever and delightful, was inescapably simplistic.

Richard Paul Russo, who reveals that the "group" I sense has at least two members when he uses his acknowledgement page to recognize a debt to Murphy, is far less simplistically idealistic, far more realistically complex. His **Subterranean Gallery** says that the pen *should be* mightier than the sword, but when push comes to shove, and no matter how cleverly or delightfully the pen

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shoves, the sword has all the clout. Furthermore, he recognizes that "sword" does not mean just the military mind or force. The true foe of art is all those who fail to recognize the existence or value of the creative, human spirit. It is militaristic destruction, yes. But it is also civic government, law, finance, business, reactionary religion, rebellion. It is *everything* other than the spirit of creation.

The sermon begins when we meet Rheinhardt, a nightmare-ridden veteran of military interventions in South America, a sculptor obsessed by dreams but tormented by the mediocrity that surrounds him in an artists' enclave ostensibly supported by a San Francisco business. He leaves the enclave and its easy support, finds a job, and begins to make progress at last on his masterpiece. We see police raiding art galleries, confiscating in the name of obscenity whatever society finds offensive or provocative. We see the tragedy of unwed mothers, abuse, suicide, and poverty set to the account of the anti-abortionists. We see a bastion of civilization gone to street people, drugs, the forces of reaction and oppression. We see the masterpiece completed, a caustic and cynical yet celebratory comment on reality, Rheinhardt's creativity burned out—he gave his work his all. And the one person who offers the most to buy the sculpture wants to destroy it for the rudeness of its truth.

Justinian is a Vietnam veteran who shadows Rheinhardt, always present, always seeming to know what is in the sculptor's mind, always prodding. Rheinhardt flees the city for five years. When he returns, the weight of reaction on the backs of his artist friends and on the backs of the people is heavier than ever. He learns that someone took a sledgehammer to his masterpiece. He learns that the mediocrity of the artists' enclave has soared, but that someone, somewhere, is still doing good work. Eventually, he lets Justinian lead him to the Subterranean Gallery of the book's title. There he finds the best of SF's artists[1] working in isolation, ignoring the establishment, unnoticed by the establishment. There is something, says Russo, to be said for an artists' ghetto. For isolation and poverty and owing nothing to sponsors or establishments or anything except one's own creative spirit. Let the work face the world complete, on its own, as insidiously, unstoppably subversive and controversial and obscene as any reactionary might fear.

For Rheinhardt, the discovery of the Subterranean Gallery is liberating. Perhaps it will do as much for you, especially once Russo finishes drawing his parallels between the creation of art and the creation of life. Certainly, you will enjoy the tale. Russo has given his future San Francisco a marvelously lived-in feel, and his people and their obsessions are delightfully real. I recommend this one as highly as I can.

Crawford Kilian's latest is **Gryphon,** a tale of vast super-science reminiscent of the glory days of basement inventors who, after one look at an alien device, can not only duplicate it but improve on it. The time is some centuries hence, well after aliens have radioed greetings and an invitation to join the Net, a group of civilizations who contribute to and share access to a vast database. Because interstellar travel is impractical, the species never meet except via representatives grown from genomes recorded in the database. Because the database con-

[1] I wonder, is it any more than a coincidence of initials that make San Francisco and science fiction go so well together?

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tains the secrets of technologies far beyond humanity's present capabilities, most research has taken the form of exploring the database and adapting what the researchers find. The current dominant technology is nanotechnology, the design and use of submicroscopic robots to alter bodies and build space-going mansions. Everyone is rich—in fact, the concept of wealth is meaningless—and everyone lives as individuals.[2]

Enter Alexander Macintosh, captain of the spaceship *Wuthering Heights* (his robotic majordomos are, of course, named Charlotte and Emily). It is his birthday, and he is attending a party on his father's cloudcastle. He will this day receive his majority, meaning total ownership of his ship and the freedom to be an isolate like everyone else. But at the party he finds himself not only drawn to young and lovely California Moran but also feeling inexplicably social. As it happens, this is just as well, for the party is interrupted by the sudden appearance of a strange planet in Earth orbit. The Chaiar, the aliens known as gryphons, have come to bring Earth and humanity into the Pattern.

Alex and California, along with Victor, a gryphon grown from database specs as a gift to Alex, flee. Alex's father is killed by the invaders. Earth is sown with the seeds of plants that will manufacture zillions of nanotech devices to make the planet more hospitable to the Chaiar. Alex's mother promptly invents a force-shield that can keep her and her estate safe. Alex and his friends dive into the database in search of gimmicks to help, find a few, and decide that they must somehow recruit other isolated humans, beginning on Venus, to merge their nanotech computers and create a supermind that can defeat the Chaiar. And they are making progress, despite the slaughter of the humans back on Earth, when Victor suddenly seems to go over entirely to the Chaiar.

Kilian displays a rich technical imagination, but I can't say that events surprised me a bit. But then I'm jaded. I've just plain read too much adventure SF. And besides, Dave Brin has handled similar material much better.

Steve Miller's and Sharon Lee's **Carpe Diem** is also adventure and predictable but it gains greatly in appeal because of its excellence in dealing with relationships. The setting is the far distant future, long after a human interstellar diaspora, when humanity exists as many disparate cultures, some of them long isolated from the rest. Sharon tells me that their editor insisted that the book, their third novel and a direct sequel to their first *(Agent of Change)*, should stand alone. Unfortunately, it doesn't quite; it takes so much background —presumably developed in the earlier book—for granted that the beginning is murky and the reader scratches his/her head raw.

Yet there is undeniable appeal, right from the start, when obvious hero Val Con, a Liaden, and his ex-mercenary sweetheart Miri, a Terran, escape interstellar villains to crash-land on an interdicted primitive world, hike to an isolated farmhouse, and begin learning the language. Meanwhile, back home on Liad, Val Con's clan is wondering where their next head had gotten himself to, his brother Shan and his sweetheart are mounting a search for the missing fellow, and the supersecret Liad-supremacist Department of the Interior

[2]This is the one feature of this story's background that most interfered with my suspension of disbelief. Humans are social animals with a real, wired-in need for family, peer, and other social contacts. It seems exceedingly unlikely that even in a technological utopia they would become isolates.

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is plotting the continuing subversion of Liad's clan structure and theft of such hypercompetents as Val Con. The plot threads are intricately interwoven, but in due time, they all come together in a very satisfying crash-bang finale, complete with music and clinch.

One great weakness is the reliance on a previous book for background details. Another is the clichéd psi-power fantasy that renders the impossible far too easy. Still, I enjoyed the story. The plotting is careful and well balanced. The momentum is more than sufficient to carry the reader to the end. And the characters are by and large more than competent. As I said, the great excellence lies in the relationships. Val Con and his Miri occupy the center ring as they strengthen their love and build a bond that will survive all. Shan and Priscilla are off to the left. Korval—the clan, the extended family with a sense of destiny, of mission—is to the right.

And yes, there will be more. The tale ends with the return of the shipwrecked Val Con and Miri to the bosom of the clan and with the defeat of the Department of the Interior's current scheme. But the Department remains, its nefarious anti-clan plots intact, and Korval still faces its greatest battles. Tune in next time.

Michael Greatrex Coney's *Fang the Gnome* gave us two happentracks (aka parallel worlds) in the greataway (aka multiverse), one occupied by small aliens on a mission to fill the gaps on a world without animals and so prepare that world for settlement by the kiki-huahua. The neighboring happentrack was occupied by humans who could see vaguely into the first and thus perceive the aliens as gnomes. The wall between the two is thinning; they may even be about to merge.

Among the humans live the Dedos, representatives of the one true god, Starquin-the-Five-in-One, who will be slain in 30,000 years unless the local Dedo, Avalona, can somehow cause humanity to destroy itself. She and her companion Merlin, together with their human fosterling Nyneve, therefore create a tale of chivalry, of knights in shining armor, of warrior glory. It's the saga of Arthur, once and future king, and to everyone's surprise it seems about to turn literally true.

Coney continues the story in his latest book, **King of the Sceptered Isle.** The happentracks do indeed merge, much to the consternation of the gnomes. Arthur indeed appears in the flesh, much to the delight of a Nyneve who has fallen in love with what she thinks is a mere creation of her imagination. At first he seems content to be just one of the boys, and her lover. But then reality must warp itself to follow story. Accident and coincidence conspire to make him a leader of men. Guinevere, Arthur's destined mate, appears. Nyneve gnashes her teeth. Morgan le Fay, another Dedo, seduces Arthur to bear his doom, Mordred. Galahad is born of unearthly origins. The Round Table is an engineering disaster. And. . . .

The classic tale works itself out in considerable detail. Meanwhile the gnomes pursue their destiny, and Avalona and Morgan argue over the proper way to ensure Starquin's survival. And then, 30,000 years later, in the era of Coney's dreamers, it all comes together with a strong reminder of Jack Williamson's over-protective robots. Does Starquin live? Of course, fiction being what it is. Does Arthur? The answer depends on what you mean by live, but if you recall your Mallory or White, you may have a hint. Do Nyneve and Arthur ever

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get together for more than a one-night stand?

Read the book, and see. It's fantasy for all those SF fans who were enchanted by the stuff in youth, rejected it in favor of SF when they saw how unreal it really was, and yet crave a hint of what hooked them first.

I hope you did not miss Michael Lahey's **Quest for Apollo** while it was available. As SF, it's a delightfully quirky variation on the theme of time travel. Yet it represents an ancient tradition indeed and thereby reminds us that SF, for all that it revels in its differences, is but a branch of the tree of literature.

The tale begins when an American writer of no great accomplishment, Fred Delbert Alderini, wanders in an Italian woodland, hears and flees what he takes for the howl of a wolf, gets lost, and meets an elderly gent who introduces himself as Virgil. *The* Virgil, who says, "I've been fifty for a long, long time. Ever since I died."

If this rings a bell, it should. Virgil is in service to the goddess Diana; for a very long time he has been approaching writers and poets whose initials fit the "D.A." template, which the goddess for some arcane reason favors, and feeding them doses of divine inspiration. Yet this time Diana interrupts Virgil as he begins his job to set the two men a rather different task: Diana's brother Apollo is in dutch with Jupiter for giving humanity a little too much enlightenment; he has, in fact, been kicked out of heaven to Earth, where he lives with no thought of his divinity and dies again and again and again, always tragically; and if he is not rescued at some point on his secular time-line, Jupiter will destroy humanity in a nuclear holocaust.

How will they find him? Pick someone you think might be Apollo, the goddess says. Someone, that is, who is about to die tragically. Go to bed. When you sleep, I will carry you back to meet him. Then you must ask him where he comes from. If he answers, "I come from a beautiful land," he is the one. Then ask him his name three times. His third answer will release him and save your kind.

Vercingetorix is their first attempt. They fail because the true Apollo is the driver of the wagon that bears the barbarian chieftain's cage toward Caesar's charnel ground, and he dies too soon. Second is the philosopher Boethius, third Conrad V, last of the Hohenstaufens, fourth the artist Pordenone, fifth the poet Alessandro Poerio, sixth. . . . Tidbits of history chosen to accent the tragedy of the way established authority invariably treats enlightening genius. Every one of them dies before saying his name the third time and thus, in history or in novel, saving our species from its suicidal bloody-mindedness. Meanwhile, Libya announces it has planted nuclear bombs in American cities and will pull the trigger if anyone messes with His Daffiness. A missile named Phaeton—that son of Apollo who took a joyride in the solar chariot, swooped too close to the ground, and left things a mite scorched—is about to be tested on a trajectory that will pass over Libya.

Our heroes try a Nazi killing-ground. They fail once more. Phaeton launches. Doom is imminent. And in the very nick of time. . . .

It's informative, thoughtful, and thought-provoking. It's even cute and fun, with occasional reminders of the classic Thorne Smith. If you find a copy, grab it.

Robert Silverberg's **To the Land of**

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the Living is a different sort of quest, albeit still one that involves the classics of antiquity, and if Virgil makes no appearance, that lack is well compensated by the presence of Caesar, Lenin, Lovecraft, Helen of Troy, Robert E. Howard, Hemingway, Freud, Herod, Picasso, Genghis Khan, and of course Gilgamesh, the ultimate archetype of the HERO! The scene is the Afterworld, a realm dominated always by the most recently dead (they are, after all, the most numerous) but populated by all those humans (and near-humans such as ape-men) who have ever lived. Here of course dwells Gilgamesh, his "life" dominated by hunting, roaming, and seeking good-buddy Enkidu, who keeps getting lost in one way or another. The tale's main excuse seems to be little more than juxtaposing characters from various eras of history, generally for cheap laughs. After enough such juxtapositions, interspersed with comments on the inertia of personality and the vagaries of memory, Silverberg allows Gilgamesh to find a way back to the land of the living (which just happens to be Manhattan) for a few last yucks and a disappointingly trite and anticlimactic ending.

I suppose he didn't want to worry about getting bombs in his mail, but I wish Silverberg had had the guts to stick in a few religious figures, such as Jesus or Mohammed, or had tried in other ways to be a bit dangerous, controversial, thought-provoking, or subversive. As is, the book just doesn't have much to recommend it. And if it reminds you of the lamentable "Heroes in Hell" (or is it "Heroes from Hell"?) series. . . . Well, what can I say?

A. C. Crispin is known for *V* and a couple of Star Trek novels. That is, she has the gift of writing adolescent melodrama for the mass market.[3] She confirms that gift with **Starbridge,** whose protagonist is Mahree Burroughs, adolescent colonial returning to Earth to go to college. Also aboard is slightly older physician Robert Gable, for whom Mahree's heart throbs. Midway in the voyage, the starship's crew detects strange radio signals and halts the journey to track them down. Naturally enough, the signals prove to emanate from a world of technological aliens, the baboon-like Simiu. Once the tedious business of learning to understand each other is out of the way, Mahree befriends Dhurrrkk', a young local, and begins to learn, under a vow of silence, something of just why the Simiu are being so cordial. And then one of the humans makes the mistake of beating at chess an arrogant young Simiu. There is a fight, shots are fired by humans but not by Simiu, whose sole fights are hand-to-hand, fang-to-fang duels of honor. One person dies. The *entente cordiale* breaks down.

Mahree alone knows the Simiu are junior members of a multi-species interstellar league. They are trying to make a successful, peaceful Contact with the humans so they may gain full membership in the league. Now their hopes seem doomed. War seems all too possible. The only recourse is for Mahree, Robert Gable, and Dhurrrkk' to flee in a "borrowed" ship to the league's headquarters and beg for arbitration.

It's no secret that *Starbridge* is the first entry in a new series built around Starbridge Academy, a training school for interspecies contacters. Yet there is no sign of the Academy in the story

[3]Gift? It pays so well that many writers swallow their scorn long enough to give it a try. Unfortunately for some writers' creditors, not all writers can do it. So yes, there's a special talent involved.

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until . . . It does not take great perspicacity to suspect that the Academy is to be created at the end of this novel. Then the stage will be set for what the publisher's puff sheet calls "Thrilling galactic exploration for the millions of *Star Trek* fans!"

Michael Kandel's **Strange Invasion** is a strange item indeed. His protagonist, Wally Griffith, has a strange brain disorder that gives him frequent hallucinations. He is therefore used to seeing the bizarre, and when an alien spaceship lands in his backyard and turns into a birdfeeder, he accepts it with neither qualm nor quaver. He even accepts it when the aliens begin to tell him, via his television, phone, mail, and so on, that a horde of tourists, the Oht, are about to arrive, that these visitors have a way of destroying the worlds they visit, and that it is up to him alone to ward them off. He has one chance in ten of succeeding, and good luck, chump!

The first influx, a zillion and a half orgiastic gourds erupting from a South American graveyard, makes the threat clear. Somehow—perhaps through some telepathic mass hypnosis—their preferred behavior spreads to the local humans and the local culture disintegrates. Fortunately, Wally manages to enlist a Marxist toucan (clearly a stand-in for ideological parrots of all kinds) and drive them off. Then to Russia come the macrames, jaded, bored unto death, and their mood, too, is catching. Wally enlists fleas and lice to return the afflicted humans to an interest in life. But then the filing cabinets arrive, obsessed with seeking beauty and finding it in the everyday, and he fails. So too does he fail with the humanoid Caraputanians, who obsessively collect the answers to questions. And in each case the humans are infected with the tourists' obsessions. They willingly surrender their own value systems, and they become nothing. Destruction, indeed.

Call it a morality play. What Kandel is describing is the impact of the arrogant and self-satisfied who go abroad only to condescend. Because these tourists have money, gadgets, and a sneer, their often unwilling hosts too readily grant them the superiority they assume, ape their ways, and destroy their own natures. They regain their self-determination only when their cultures lie in ruins and the tourists go elsewhere.

Kim Stanley Robinson is a writer of such varied talents that it is difficult to say he writes some particular kind of fiction. That is, one cannot capture him or his work in a phrase. If you don't believe me, just think of his books: *Icehenge*, *The Memory of Whiteness*, *The Gold Coast*, *The Wild Shore*. Now add his latest, **Escape from Kathmandu,** a set of four linked novelettes set in the Himalayas. The set begins with the title story, in which zonked-out climbers rescue a yeti from scientific exploitation; it includes a hilarious chase scene. "Mother Goddess of the World" is the tale of an accidental climbing of Everest with the aid of a multi-incarnated Tibetan mystic. "The True Nature of Shangri-La" tells how the yeti returns, wearing his Dodgers baseball cap and uttering his trademark "Na-mastayyy," to help our crazy climbers preserve the navel of the world from civilization. "The Kingdom Underground" reveals the vast network of underground tunnels that permits the mystics of Shangri-La to rule the world in secret, and the threat to them that is modern sanitation.

The book isn't to be taken entirely seriously, of course. Robinson does play his mountains, climbers, mystics,

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and yetis for laughs. But the laughs are as genial as can be, Robinson's touch for scenery and setting is unrivalled, and the book is good stuff. You won't be wasting your money.

The fourth (Summer 1989) issue of **Pulphouse** is out, and it is by now so clear that this small press "hardback magazine" is a success that I don't expect to mention future issues. As for this one, it's centered on SF, with bits of mainstream, fantasy, and horror. There's a bit of sex, some of it quite explicit. The worst story is surely Robert Sheckley's "Mind-Slaves of Manitori," in which the author displays astonishing ignorance (considering his history) in the remark that increasing an asteroid's spin will increase the apparent gravity *on the outside*. The best may be Doug Beason's "A Reasonable Doubt," which was written shortly before the *Challenger* blow-up, which promptly made it unsalable. The rest are quite readable; the writers include Algis Budrys, Nina Kiriki Hoffman, Kevin O'Donnell, Jr., Nancy Etchemendy, and Bruce Boston, among others. There are also short essays on writing by Jack Williamson and on art by Jon Gustafson, as well as a Damon Knight reprint.

As always so far, a good buy. ■

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brass tacks

Dear Dr. Schmidt:

I rarely write letters to editors and, to the best of my recollection, this is the first that I have written to *Analog*, which I began reading—as *Astounding*—sometime before WWII.

Unlike Kay Saunders (Brass Tacks, September 1989), I felt quite comfortable reading Rick Shelley's "The Sylph." In fact, I thought it was very well done, with the exception of a minor technical error or two which in no way detracted from the story itself. My quarrel is with Ms. Saunders.

Ms. Saunders might be quite correct in saying that the onset of the menses does not signal readiness to bear children—that is outside my field of expertise—but, in some societies, it *does* signal reaching marriageable age. I grew up in such a society—or what once was such a society.

Among the Apache tribes, when a girl had her first menstruation, her parents arranged her puberty rite, at the conclusion of which she was a na'ilihn, or marriageable maiden. I will not describe the ceremony, which takes several days, first, because, at least to the girl, it is a sacred thing, and second, because this is not a treatise on the life and customs of the Nde. Conceded that civil law in Arizona and New Mexico now forbids such early marriages, nonetheless, until well into the twentieth century, they were commonplace, and not just among the Indian tribes. Ms. Saunders's outlook might be perfectly reasonable in an industrialized and urban society but frontier societies, which she appears to hold in contempt, play by a different set of rules. They tend to feel that they cannot afford to waste any part of a woman's reproductive life. Unless she is quite young herself, Ms. Saunders should be able to remember that many "old maids" were not exactly ancient.

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Apache women rarely died in childbirth, undoubtedly because, among their ancestors, a woman with a predisposition toward serious birthing problems was eliminated from the gene pool. As for producing weak children, when one considers the exploits not only of such well-known figures as Mangas Coloradas, Cochise, Victorio, and Gokleya, who took the name Geronimo (and was not a chief, but a diyin, or medicine man) but of such lesser ones as Chihuahua, who is said to be *my* great-grandfather (Apache genealogies are not well documented, and descent is matrilineal), and a host of others, one would hardly call the Apache a race of weaklings. (The fact that they eventually capitulated is not significant here. The army had 12,000 troopers in southern Arizona, and its considerable losses were continually replaced, whereas the Apache were fighting a war of attrition. Cochise never had more than 300 warriors at any given time). Twenty-five miles was considered a day's march for a trooper on horseback. An Apache warrior could travel three times as far on foot.

Now, let's look at the hero's side of the story. There is no cultural inconsistency there either. Until comparatively recent times, it was not uncommon for one society at war with another to adopt a captured enemy. A professed authority on the life of Daniel Boone should know that, in 1778, he was captured, and later adopted, by the Shawnee. The fact that Boone subsequently escaped has no bearing on the argument. There is no good reason that a frontier society —particularly one that might be short of manpower—should not adopt a similar custom, not only to help ease the manpower shortage, but to add to the diversity of the gene pool. In one way, the custom has persisted well into this century, since there are a large number of former German and Italian (and others) POWs who are now American citizens.

A minor technical error? Oh, yes! A farm family preparing themselves for a hard winter would have spent less time and labor canning and freezing all those beans and corn. They would have "put up" a smaller amount, simply because they liked them, and harvested the remainder of these crops in dry, mature form. They would have also put a goodly amount of potatoes into the root cellar (maybe they did, and Mr. Shelley just didn't tell us about it). This would have required far less labor and the crops would have stored well without the necessity of freezing, thereby freeing the freezer space for a beef and a hog—or the local equivalent thereof. But, as I said, this is minor and in no way detracts from the story, which was well thought out, well written, and interesting. Let's see more of Mr. Shelley in the future.

JOHN CARVILLE

Alton, MO

P.S. My wife, who is no stranger to a self-sufficient life-style, and *is not* an Indian, tells me that she also enjoyed the story, and was not offended by it.

Dear Mr. Schmidt,

Since, with your editorial "Job Qualifications" (Aug. 1989) you have chosen to uncap once again such an ancient can of worms, let me attempt to grasp some of the more wriggly specimens:

1. The first question to ask when anyone proposes limits on anything is: who will set those limits, and how will those people be prevented from molding those limits to suit their own personal interests? Who will guard the guardians?

2. Any attempt to divide a society

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along any lines and deny rights to one sub-division of that society for reasons other than outright violence or criminality will inevitably create an aristocracy, the very thing democracy is intended to prevent.

3. It is very unlikely that such a system would really make a positive difference at all. Educated or ignorant, a human being is still a human being, and it is a fact well known to any politician that people do not vote for policies or programs, they vote for people. No matter what their educational status. Nor is this necessarily a bad thing, for an elected official is not only an administrator, a policy maker, he is a *leader*, and this is his most important job. The last presidential election clearly showed us that the people will gladly choose even the smallest hint of leadership qualities over bureaucratic efficiency.

While I agree that the educational status of the voting (and non-voting) public is a matter of grave concern, I think the answer is to utilize the school system to *educate*, not to produce cookie-cutter citizens on an assembly line basis.

By the way, my own formal "education," which consisted mainly of learning how to smoke dope and steal bicycles, ended in the ninth grade. Would I be allowed to vote under your system?

J. DAVID SANDERFER

Houston, TX

Certainly who sets the limits and who guards the guardians is an important and difficult question. That is not sufficient reason to avoid trying to answer it.

As for whether you'd be allowed to vote, you haven't given enough information to answer that! My proposal was not *based on formal education, but on demonstrated basic knowledge, without regard for how you got it. If you have it, or took the trouble to get it in the future, then of course you'd be allowed to vote.*

Dear Dr. Schmidt:

Re your editorial in the Aug. 89 issue, regarding suitable education for voters.

I heartily endorse the sentiments behind your proposition, but beg to point out that the people with the authority to pass a minimum voter-education bill are the ones who would be affected the most. These are the same people who tried to pass a surreptitious massive pay raise for themselves recently. The USSR and China have the same problem with entrenched bureaucracy. When *my* job is on the line, how do you think *I* would vote? All that aside, tying education and voting together today would mean political suicide.

Also, starting system improvements at the bottom of the pile is like working on the stable door while Dobbin cavorts in the pasture.

However, all is not lost. We, or at least Europe, used to have organizations called Guilds, whose function was to ensure that its members received adequate training in their chosen trade. Unfortunately, these were supplanted by Trade Unions, and see what a mess they've made of the world!

It would be more attainable if our centers of higher education got practical for once, and developed a series of training programs to ensure minimum information levels for each stage of government, be it federal, state, county, city or town.

Then start with the top. Instead of checking on pork requirements in their home states, our senators and congressmen would take mandatory examinations. If they flunk, out with the rascals.

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Anyone running for office would have to hold up his test diploma to be eligible.

When they're done, do the same with state officials, and so on.

Let's make government service an honorable career. Have officials serve a maximum of say, four or six years in each office, then run for a higher office, taking the test on the way. Refresher courses during his/her stay in office, to keep up with ever-changing conditions. When he has reached his maximum capacity, (before the Peter Principle cuts in), send him out to industry as a business executive, a desirable, knowledgable person, well trained for decision making.

On further consideration, bring back flogging for corruption while in public office!

By starting at the top, the can of worms labeled "Voter Education" does not have to be opened, and the desired result is obtained in far less time.

This program is not something the polls will initiate for themselves. It will need someone pretty high to start it rolling. Like the president. He *is* the Education President, isn't he? Right down his alley, right?

Now, who's going to bell the cat?

LESLIE R. GORE

Lady Lakes, FL

Dear Dr. Schmidt,

I usually enjoy your monthly editorials, because they are well thought out and they often give solutions, where others simply flap their gums without pointing out anything new. In your August 1989 editorial, "Job Qualifications," I felt your solution was too narrow in scope. The real problem is our educational system. In this country, we seem to value education about as much as we value a good sitcom or an exciting football game. Every time I listen to the news, it seems that the educational budget is being cut even more! Usually, it is so we can destroy the world three or four more times. Once would be enough for me. We need a government who is behind a quality educational system. Maybe if President Bush would actually *become* the Education President and put his money where his mouth is, many of our problems could begin to be solved. This includes what you have put on the table: How can we have a responsible government with irresponsible voters? The answer is to teach them how to be more responsible. Give them the tools to evaluate the people they choose to represent themselves!

My first concern with your solution is how it changes our form of government. To test people's knowledge, a test of some kind would have to be made up. Who would create this test to see if people have "earned" their right to vote? Will the government do it? That's a pretty scary thought, seeing their current incompetency in other areas. My concern is how the government could twist this test to control the people. Like tests that were used to stop blacks from voting in the past, this test could be used to leave out certain "undesirables" from the voting process. The tests could be biased so only people of certain backgrounds could pass the test. I find this much more dangerous then just having "unqualified people" vote.

Another concern of mine would be the way it would change our system of government. If your ideas were implemented, we would no longer be a democracy. Once again it would be as it was when it began—an elitist government. Those who are educated and have the money shall be able to vote. Those who don't, will not be able to. I do understand that it's not much different

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now. But your system would finalize it. At the present time, the poor don't vote because they choose not to. Under your system, they will never then have the chance.

Our first priority should be to make our education system comparable with those in Japan, West Germany, and almost every other country in the world. When the people are educated, a larger percentage will vote. If people have an understanding of their government, maybe they will want to take part in electing it. To me, with the current trend of apathy throughout the country, the potential for misuse is far greater than its benefits. Educating people first, then trusting them to choose good leaders is a far more rewarding idea than picking out who shall choose our leaders based on an "education test." A democracy is based on *all* the people. Not just a selected few.

ARON GAMMAN
23814 Woodway Rd.
Beachwood, Ohio 44122

In cases where you accurately represent what I said, we seem to be basically in agreement—we both say "Improve education!" Unfortunately, your paraphrases are not always accurate—for example, your paragraph that concludes "The poor . . . will never then have a chance" is based on assumptions quite foreign to what I actually said. The essence of what I proposed was: "Require education, and *make sure everybody who wants it has the chance to get it!"*

As for whether the society thus produced would still "be a democracy," it seems to be an Article of Faith with a great many people that whether a system is "A Democracy" is the ultimate requirement, even though they can't agree on what it means. I propose that we judge systems not by how well they fit a preconceived label, but by how well they work.

Dear Stanley,

Some thoughts on "Job Qualifications":

1. The survey says that 95% (or 80% or 60%) of people are scientifically illiterate and therefore can be expected to oppose your reform. In fact, if you add up the truly illiterate, those afraid they may be illiterate, and those who just don't like your reform, you'd have a very clear majority against you. In a democracy that matters.

2. Assuming your prerequisite would be *basic* scientific literacy, the means to gain it is already open to all, in a free and convenient manner. It is called your local library. Use of it can result in a layperson's grasp of science, or anything else for that matter. There is no need to reform our educational system *on that ground* (there may be others).

3. Being able to participate in government would not be a sufficient incentive. Given voter turnouts of the past decade, participation is simply not that highly valued. However, money is.

I propose that some sort of scientific literacy test be estabished nationwide to be taken voluntarily once a year. Each time you pass it you get $1,000 tax free. There being about 200 million Americans of an age to take such a test, the maximum possible annual outlay would be about ⅔ of what we now spend on either education or defense, both of which would be immeasurably improved in the process. Expensive? Yes! Worth it? Also yes!

4. Then we can march on to other illiteracies, such as economics.

HAROLD ETTELT
Hudson, NY

Yes, basic *literacy, in science and other fields, is what I was advocating (con-*

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trary to the misapprehension of many who wrote!). It's quite true that libraries, and many educational systems, already make this available. It's also true that, far too often, people aren't taking advantage of it. The radical part of my proposal is that people's educational qualifications be judged not by what course-taking motions they've gone through, but by what they've learned.

Dear Dr. Schmidt,

Curiosity got the better of me last week. I bought a 1928 issue of *Amazing Stories*, edited by Hugo Gernsback. I wanted to see what the Father Of Science Fiction had to say about the future, 60 years ago.

Some of his speculations were correct, and others weren't. All of them were interesting in light of what really happened. But one statement in particular absolutely floored me! How could any SF editor, regardless of his era, write such a thing as this?

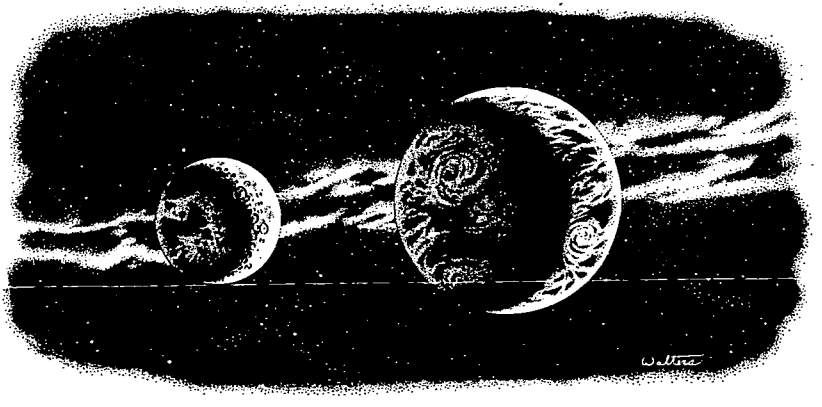
". . . Few of our scientifiction writers thought that it would ever be possible to transmit color television; yet, recently this also has been accomplished by Mr. Baird of London. . . . So here we have another great scientific triumph, which was not expected for at least 50 years. . . . The time is not distant when it will be possible for us to witness a ball game a thousand miles away. Nor will it be long before every radio enthusiast, sitting in his home, will be able to see a prizefight, in all its interesting and brutal details, while it is being fought. . . .

"So we see that science is catching up with fiction and prediction rather quickly, and our imaginative fiction writers will soon be hard pressed for new ideas in order to keep in the swim."

Imagine that! The Father Of Science Fiction suggested that writers had nearly exhausted the good SF ideas! As early as 1928! Thank goodness human imagination and science (which are almost the same thing) didn't really run dry.

WILLIAM WRIGHT

Goleta, CA ■



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a calendar of analog upcoming events

30 March-1 April
I-CON 9 (Long Island SF conference) at SUNY@Stony Brook, Long Island, N.Y. Gaming Guest of Honor—Steve Jackson, Gallun Award—Sam Moskowitz. Registration—$18 until 15 March, $20 at the door. Info: I-CON, Box 550, Stony Brook NY 11790.

6-8 April
STELLARCON XV (North Carolina SF conference) at the University of North Carolina, Greensboro, N.C. Registration—$10/day or $25 for the weekend. Info: StellarCon XV, Science Fiction Fantasy Federation, Box 4, Elliott University Center, UNCG, Greensboro NC 27412.

13-15 April
BALTICON 24 (Baltimore area SF conference) at Marriott Hunt Valley Inn, Hunt Valley, Md. Guest of Honor—Robin McKinley, Artist Guests of Honor—Charles Lang and Wendy Snow-Lang. Registration—$25 until 15 March 1990. Info: Balticon 24, %BSFS, Box 686, Baltimore MD 21203.

13-15 April
EASTCON '90 (British National SF Convention) at Adelphi Hotel, Liverpool, England, Writer Guest of Honour—Iain Banks, TV Writer Guests of Honour—Nigel Kneale and Ken Campbell, Art Guest of Honour—SMS, Fan Guest of Honour—Anne Page. Theme—Putting the Science Back into Science Fiction. Registration £20 until 1 December 1989. Info: 15 Maldon Close, Camberwell, London SE5 8DD. US Agent: Mary Burns, 23 Kensington Court, Hempstead NY 11550.

20-22 April
12th Annual J. Lloyd Eaton Conference on Science Fiction & Fantasy Literature (Academic SF conference) at University of California, Riverside, Calif. Info: Dr. George Slusser, Eaton Conference Coordinator, Attention: Editor, University Library, Box 5900, UC Riverside, Riverside CA 92517. (714) 787-3233.

20-22 April
AMIGOCON (western Texas SF conference) at Embassy Suites, El Paso, Texas. Guests of Honor—Poul and Karen Anderson, Artist Guest of Honor—David Cherry. Registration—$12 until 13 April 1990, $15 at the door. Info: Amigocon 5, Box 3177, El Paso TX 79923.

23-27 August 1990
CONFICTION (48th World Science Fiction Convention) at Netherlands Congress Centre, The Hague, Netherlands. Guests of Honor—Joe Haldeman, Wolfgang Jeschke, Harry Harrison; Fan Guest of Honor—Andy Porter. Registration—$65 until 31 December 1989. Supporting—$28 until 31 December 1989. This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition—the works. Join now and get to nominate and vote for the Hugo Awards and the John W. Campbell Award for Best New Writer. Info: Worldcon 1990, Box 95370, 2509 CJ The Hague, Netherlands. Enclose sufficient International Reply Coupons for airmail response.

30 August-3 September 1990
CONDIEGO/NASFiC (North American SF Convention) at the San Diego Omni Hotel International, San Diego, Calif. Guest of Honor—Samuel R. Delany, Fan Guest of Honor—Ben Yalow. Registration—$65 until 1 January 1990, $75 thereafter, $85 at the door. Supporting membership—$25. Info: ConDiego, Box 15771, San Diego CA 92115.

—Anthony Lewis

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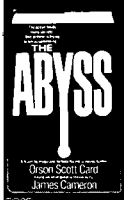

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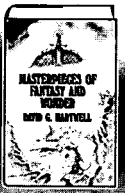

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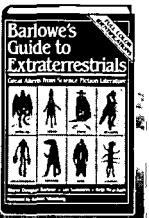

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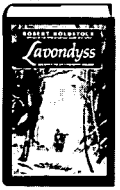

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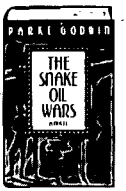

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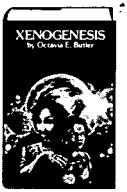

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